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IN MEDICINE AND SURGERY

UNDER THE GENERAL EDITORIAL CHARGE OF
CHARLES L. MIX, A. M., M. D.
PROFESSOR OF PHYSICAL DIAGNOSIS IN THE NORTHWESTERN
UNIVERSITY MEDICAL SCHOOL

VOLUME VIII

PHARMACOLOGY AND THERAPEUTICS

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INTRODUCTION.

In accepting the care of the department of pharmacology and therapeutics of the PRACTICAL MEDICINE SERIES, the Editor feels the full weight of the responsibility resting upon him, as well as the difficulty of his task.

Pharmacology has, to a great extent, become veterinary pharmacodynamics; that is, the study of the action of chemicals upon lower animals carried on by non-medical laboratory men without practical clinical training or interest; and most of this work is without practical results, though, no doubt, there is many a golden nugget for the medical practitioner to be dug out of this mine of theoretic knowledge.

The reports of clinical results by medical practitioners, on the other hand, are only too frequently devoid of the scientific critical spirit, which alone should entitle them to consideration in these pages. Practitioners would do well to accept the suggestions of Sollmann (abstracted in this volume), to subject remedies to the crucial test by what he calls the "comparative method," or the "blind test." As it is, the Editor has had much difficulty in deciding upon what is worthy of selection from this mixture of information and misinformation that goes by the name of "clinical reports."

Therapeutics has, of late, been losing ground in the curriculum of medical schools. It is reported, for instance, that Johns Hopkins has abolished the course in therapeutics; and what Johns Hopkins does other schools soon copy. There is a good reason for this, as most of what was taught under the heading of therapeutics was essentially practice of medicine, and was also taught—and better—by the teachers of medicine and of the specialties. After all, is not all clinical practice ultimately therapeutics? Unfortunately this is not true of most of the clinical teaching, which runs notoriously to diagnosis. Never was a greater fallacy uttered than: "Given the diagnosis, the treatment is easy." And yet this is the spirit in which most clinicians teach.

Between the pharmacologist who does not care for practice and the clinician whose chief concern is diagnosis there is need for the services of those who are pharmacologists as well as clinicians, to bridge over the chasm separating the laboratory from the bedside. As great as the need is for "experimental therapeutics," laboratories devoted to such work, which should be located in the teaching hospitals, are practically nonexistant.

The department of therapeutics should be the common meeting ground of all who are interested in the healing art. Its special work should be the development and improvement of therapeutic technique, the suggestion and elaboration of new methods of treatment as well as the testing of alleged therapeutic truths, not only for validity, but also for degree of general applicability. A therapeutic truth established by an ophthalmologist, for example, might be of utmost importance to every practitioner, if interpreted and extended by one competent to do so. On the other hand, no specialist can afford to become separated from the general trend of therapeutic progress, for he may find suggestions in it directly applicable to his speciality; and, after all, specialists treat human beings and not merely parts of them.

To make these pages such a meeting ground, without trespassing upon territory more appropriately and better cultivated by the specialists who contribute to this series, is the ambition of the Editor. He is only too well aware that he has fallen short of accomplishing this result. But, if he has, it has not been, he believes, from lack of desire or of industry, but the inherent difficulty of the subject. The Editor's aim has not been to present anything like a complete list of abstracts of the year, but rather to deal with a comparatively limited number of current topics that seem to him of *practical* importance to the medical practitioner, for is not this the *Practical Medicine Series?*

The alphabetic arrangement of the subject matter has been abandoned for one which it is hoped may render the presentation somewhat more interesting. An alphabetic arrangement, while easiest, is after all of no real advantage if a book is provided with a good index. Inasmuch as this series is intended for the man who stands at the front in the battle against disease, it seemed best to discuss the progress in the various fields from the standpoint of the desired effect. There are three fundamental modes of attack against disease: the removal of the cause (etiotropic therapy), replacement of what has been lost or damaged or is lacking (restorative therapy) and relief or allaying of symptoms (symptomatic therapy). We shall, therefore, discuss the remedial measures, so far as possible, under these three headings, with the difference that, by using the term "symptom therapy" instead of "symptomatic therapy," we shall extend the meaning of this term to include all those forms of treatment in which a definite symptom is either intentionally produced or suppressed, even though at times it may remove a cause. Thus cathartic, as well as analgesic treatment, is taken up under this heading. In marked contrast is "symptom therapy," the production of symptoms is avoided, as much as possible, whenever we employ etiotropic or restorative therapy. This has considerable bearing on the technique of treatment. Toxicology, which employs all three forms of treatment, really a part of the practice of medicine, is by common consent assigned to this department, hence we shall make a special division of this topic. It is difficult, at times, to fit non-pharmacal therapy under one of the above headings; therefore some of these topics have been taken up separately, whenever they could not, to better advantage, be considered under one of the above divisions. After all, classification, like habit, is a good servant but a poor master; therefore, classification has not been permitted to interfere with other more important interests, and not infrequently violence has been done to its logical application.

For having used the English form in the prescriptions given in this volume, the Editor may perhaps be pardoned on the ground that, as a result of an investigation of this question,[1] he is convinced that English is as good as and, in some respects, even better than Latin in prescription writing.

BERNARD FANTUS.

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[1] Jour. Amer. Med. Ass'n., May 27, 1916.

PHARMACOLOGY AND THERAPEUTICS.

GENERAL THERAPEUTIC TECHNIQUE.

It will be readily admitted that technique, which might be defined as the best way of doing things, is a matter of first importance to the practitioner. Improvements in therapeutic technique have therefore been given a special share of attention throughout. Under the present heading will be taken up matters of general applicability.

A Test for Efficiency of Treatment. As a crucial test of therapeutic evidence, T. Sollmann[1] proposes what might be called the "comparative method," or the "blind test." "In this the patient, or a series of patients, is given the preparation which is to be tested and another preparation which is inactive, and the observer aims to distinguish the two preparations from their effect on the patient. Surely if the drug has any action at all, it will be possible to select correctly in a decided majority of the administrations.

"The same principle can be applied in distinguishing the superiority of one preparation over another. In this case the two preparations would be given alternately to different patients, and the observer would try to distinguish them by their effects. Here again, if one drug is really superior or otherwise different from another, to a practically important extent, the observer will surely be able to make the distinction.

"This method is really the only one that avoids the pitfalls of clinical observation; it is the only method that makes the results purely objective, really independ-

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(1) Jour. Amer. Med. Ass'n., July 21, 1917.

ent of the bias of the observer and the patient. It is the only method, therefore, which determines whether it was really the pudding that was eaten and not some other dessert.

"In principle this method does not usually offer any very great difficulties. It is, of course, necessary that the two preparations to be compared shall resemble each other so closely or shall be flavored, etc., so that they can not be distinguished by their physical properties. This is usually not a very difficult matter. The method does not jeopardize the interests of the patient, for it is understood that no drug would be tested in this way unless there is some reason for believing that it has a value. When the patient's condition is such as to demand treatment, then he would be receiving either the standard drug or the drug which the experimenter believes may be superior to the standard."

THE NEW PHARMACOPOEIA AND THE NATIONAL FORMULARY.

Since the publication of the last issue of the annual devoted to this topic, the ninth decennial revision of the United States Pharmacopoeia and the fourth edition of the National Formulary have become official. It may therefore be desirable to say a few words here in connection with these new standards for prescribing, which it appears to the Editor receive altogether too little consideration in medical literature.

THE PHARMACOPOEIA.

Mils vs. c.c. One of the changes that might interest the practitioner is the replacement of the term cubic centimeter by the word mil, the first three letters of the word milliliter, which is the correct systematic title for this most important fraction of the liter. It is abbreviated "ml." The British Pharmacopoeia preceded ours in making this change, and the "adoption of the term promotes international uniformity in the two pharmacopoeias published in the English language." Unfortunately, it has been argued, the adoption of this method of notation is a direct blow at internationalism, for no pharmacopoeia in any other language has adopted this term. Some friends of the metric system also deplore the introduction of this new term as endangering the adoption of the metric system by the general practitioner. It appears to the Editor, on the contrary, that the term "cubic centimeter" is so long and unwieldy that it might actually have had something to do with making the metric system less popular. Special difficulty was experienced by those not familiar with the usages of the metric system in expressing in words such quantities as 0.001 c.c. or 0.01 c.c. Should they be read "one-thousandth of a cubic centimeter," "one-hundredth of a cubic centimeter!" How much simpler to use the word mil in the same way as we use the word gram; and to read "millimils" and "centimils."

The hostility to this innovation on the part of pharmacologists in general, some of whom were on the Committee of Revision, can not but be considered unfortunate. If they felt so strongly against this change, they should have been able to set forth their view and convince the other members of the committee. Once it was adopted by this national body, loyalty might have at least a share in leading one to take up with it. Most important of all, however, is the fact the term "mil" is a decided simplification; and it ought to be welcome for this reason if no other. When will simplified spelling invade the sacred and antique realm of the pharmacopoeia? Life is too short to carry forever on our shoulders the burden of etymology and of ancient usage.

Biologic assays have been introduced as obligatory in case of pituitary solution and cannabis and its preparation; as optional in case of digitalis, strophanthus, squill, aconite and suprarenal gland.

Admissions and deletions. Of those articles official in the eighth revision of the U. S. P., 243 have been dismissed, while 67 new ones have been introduced. The uneasiness of the friends of some of the deleted 243 may be allayed when they understand that all the deleted articles have immediately and automatically found place in the National Formulary. Among the admissions, the following may be of interest to the general practioner:

Phenylcinchoninic Acid (Acidum Phenylcinchoninicum) is the official disguise under which atophan masquerades. It is insoluble in water; and permanent in the air; average dose, 0.5 gm.

Diacetylmorphine Hydrochloride (Diacetylmorphinae Hydrochloridum), or heroine hydrochloride, is soluble in two parts of water; average dose, 0.003 gm.

Ethylmorphine Hydrochloride (Aethylmorphinae Hydrochloridum) or Dionin, soluble in 8 parts of water; average dose, 0.015 gm.

Cotarnine Hydrochloride (Cotarninae Hydrochloridum) or stypticin, very soluble; average dose, 0.06 gm.

These three are opium derivatives, cotarnine being prepared from narcotine; hence, prescriptions for them must meet the requirements of the Harrison antinarcotic act, though cotarnine is by no means a narcotic,[2] but used with good results against uterine hemorrhage, especially excessive menstrual flow.

Agar (Agar-Agar), average dose, 10 gm.; and *Phenolphthalein* (Phenolphthaleinum), average dose, 0.15 gm.; and *Magnesia Magna* (Magna Magnesiae) or milk of magnesia, average dose, 10.0 ml., have established themselves sufficiently as cathartics to merit official recognition.

Bismuth Magma (Magma Bismuthi), Milk of Bismuth, average dose, 4 ml., and *Bismuth Betanaphthol* (Bismuthi Betanaphtholas) are antidiarrheals.

Creosote Carbonate (Creosoti Carbonas) or Creosotal, probably the best administration form of creosote, for it is almost devoid of the creosote odor and taste, and of its irritant action, is an oily liquid insoluble in water, freely soluble in alcohol; average dose, 1 gm.

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(2) It may be of interest to note here some of the other peculiarities of the Harrison act. We quote from the *Apothecary*, April, 1917, page 33. *"Novocaine not covered by Harrison law:* The Farbwerke-Hoechst Company advise that the United States Circuit Court of Appeals for the Second Circuit in an unanimous opinion has confirmed the decision of Judge Grubb of the United States District Court, holding that Novocain, Anaesthesin, Orthoform, Holocain, etc., do not come under the Harrison narcotic act, and that physicians, dentists, druggists, and wholesalers prescribing, using or selling them can do so without registering or using the Harrison narcotic blank in ordering them. They further state that they believe that this decision also entitled Novocain and other similar preparations to transportation by mail, which was denied them by the Post Office Department under the ruling of the Treasury Department, and that steps are being taken to have the Postal Department rescind its exclusion order."

Beta-eucaine Hydrochloride (Beta-eucainae Hydrochloridum), soluble in 30 parts of water and 35 parts of alcohol, and *Quinine and Urea Hydrochloride* (Quininae et Ureae Hydrochloridum), soluble in 0.9 parts of water, have both established themselves as useful local anesthetics. The latter is also, owing to its high degree of solubility, a useful administration form of quinine; average dose, hypodermic (once daily), 1 gm.

Quinine Dihydrochloride (Quininae Dihydrochloridum) requires only 0.6 part of water for solution, is therefore the most soluble of all the quinine salts; and, according to a report, abstracted in a later portion of this volume, the best form of quinine for intravenous administration; average dose, tonic, 0.1 gm., antimalarial, at least 1 gm. daily.

The addition of *Quinine Tannate* (Quininae Tannas) as a comparatively tasteless administration form of quinine seems to the Editor unfortunate, for we have much better preparations of slight degree of bitterness in Aristochin and Euquinine, the U. S. patents of which have, according to "New and Non-Official Remedies," expired. Aristochin is sufficiently free from bitterness to be made into perfectly delicious chocolate tablets.

Emetine Hydrochloride (Emetinae Hydrochloridum), a *white* powder (to be distinguished from "Emetine, Alkaloidal Mixture," which is dark colored), freely soluble in water or alcohol; average dose, hypodermic, 0.02 gm., has, of course, been included. So has been *Solution of Hypophysis* (Liquor Hypophysis), standardized by biologic assay upon the guinea-pig uterus; average dose, 1 ml.

Less justified, on the other hand, seems to the Editor the inclusion in the U. S. P. of *Calcium Glycerophosphate* (Calcii Glycerophosphas), soluble in 50 parts of water, and of *Sodium Glycerophosphate* (Sodii Glycerophosphas), very soluble in water, nearly insoluble in alcohol, the average dose of each of which is given at 0.25 gm. *Calcium Lactate* (Calcii Lactas), soluble in 20 parts of water, almost insoluble in alcohol, is a more valuable addition, as it is a fairly soluble calcium salt, less irritating than the more soluble calcium chloride. Average dose of calcium lactate is 0.5 gm.

Oleoresin of Parsley Fruit (Oleoresina Petroselini), Liquid Apiol, has been introduced in deference to the demand created for it as an emenagogue, whether justly or unjustly remains to be seen; average dose, 0.5 ml. in capsules.

Caffeine Sodio-Benzoate (Caffeinae Sodio-Benzoas), soluble in 1.1 parts of water, offers a readily soluble caffeine preparation for hypodermic use; average dose, hypodermic, 0.2 gm.; by mouth, 0.3 gm.

Theobromine Sodio-Salicylate (Theobrominae Sodio-Salicylas), Diuretin, soluble in 1 part of water; average dose, 1 gm., and *Theophylline* (Theophyllina) soluble in 100 parts of water, average dose, 0.25 gm., are useful diuretics. The latter is more powerful but also more irritant than the former.

Trinitrophenol (Trinitrophenol), Picric Acid, soluble in 78 parts of water, in 12 parts of alcohol, used in saturated aqueous solution as a dressing for burns.

Some other new preparations will be noted subsequently.

THE NEW NATIONAL FORMULARY

This volume is a heterogeneous mixture of useful and useless formulae. Nevertheless its study would well repay the physician who aims to present medicaments to his patients in the most elegant form possible. Special attention might be called to the elixirs of low alcoholic percentage, most of them of delicious flavor:

Compound Elixir of Almond (Elixir Amygdalae Compositum), containing 5 per cent. alcohol.

Compound Elixir of Cardamom (Elixir Cardamomi Compositum), containing 10 per cent. alcohol.

Aqueous Elixir of Glycyrrhiza (Elixir Glycyrrhizae Compositum), containing 5 per cent. alcohol.

Compound Elixir of Vanillin (Elixir Vanillini Compositum), containing 5 per cent. alcohol.

Another preparation distinctly worth while is:

Aromatic Castor Oil (Oleum Ricini Aromaticum). Disguised by saccharin and aromatics; average dose, 15 ml. While children hardly cry for it, they generally take it readily. It seems less successful with adults.

There are many other useful preparations in this formulary. Those mentioned here are all that our available space will admit.

•

METHODS OF ADMINISTRATION OF MEDICAMENTS.

Oral Administration. The administration of deliquescent and of liquid drugs in capsules is easily possible, says N. S. Davis,[3] by incorporating them in a wax mass, made of one part of beeswax and three parts of castor oil. The ingredients are melted and mixed, and then allowed to cool. For from 0.5 to 0.8 gm. of potassium or sodium iodide, from 0.1 to 0.15 gm. of the wax mass is needed. Iodine in doses of 0.05 or 0.10 gm. or even double these amounts can be given, without causing gastric discomfort by prescribing it with 0.3 gm. of the mass. Guaiacol and oil of santalwood and similar substances can be readily mixed with from one-half to equal parts of beeswax and made into a mass by gently heating. However, this is only necessary, when these substances are prescribed with frequency. Ordinarily, from 0.1 to 0.15 gm. of the wax and castor oil combination suffices for 5 minims of oily liquids. In all cases, after the mass is formed, it is placed into capsules. The capsules are permanent, keeping for weeks ordinarily and in the hottest and dampest weather, if placed in a corked bottle. That absorption takes place readily can be shown by finding iodine in the saliva three minutes or less after a capsule containing iodide has been swallowed.

[''Encapsulate medicament whenever possible, but do not prescribe very irritant substances in capsules without dilution,'' is a good rule in prescribing. Davis' suggestion is a valuable method of diluting irritant substances, so that they are well borne by the stomach.—Ed.]

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(3) Jour. Amer. Med. Ass'n., Oct. 14, 1916.

Sublingual Medication. This method, devised by Dr. W. Paulson[4] about thirty years ago, is considered by him to be quicker, easier, safer, cleaner, and far more reliable than hypodermic injection. The only preparation necessary is rinsing with water, if the mouth is dry. A hypodermic tablet, powdered with the point of a penknife, on paper creased in the center, and dropped just behind the teeth, the tongue being restored to its normal position, will be absorbed in a few seconds. The full effect of the dose may be absolutely depended upon, almost immediately. Thus administered, a morphine and atropine tablet will relieve pain and shock as nothing else will, and is of inestimable benefit in the emergencies of warfare. An apomorphine disk, administered in the way indicated, will induce vomiting at once.

P. R. Cooper[5] endorses what Dr. Paulson had said regarding this method of administration, which he suggests calling "sublingual absorption." The patient should be advised to hold the tablet *in situ* until it is dissolved, and *not to swallow* until the bitter taste of the drug has disappeared. It may be used in cases of vomiting, coma, esophageal obstruction, etc.; indeed, it should be practised almost to the exclusion of the hypodermic syringe. A great advantage of this method is that a layman can carry it out. Thus many a night visit might be saved that is made merely for the purpose of giving a hypodermic injection.

A. P. Murtz[6] is also fully in accord with Dr. Paulson. He dwells not only on the trouble in preparing a "hypo," but also on the personal objection on the part of many patients to such injections. Murtz practically uses the hypodermic syringe only for the induction of local anesthesia.

[Not only does sublingual administration seem to threaten the popularity of the hypodermic syringe, but the term "oral administration" will have to be abandoned, for this method is certainly even more "oral" than swallowing.—Ed.]

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(4) Practitioner, October, 1916.
(5) Ibid., November, 1916.
(6) Ibid., December, 1916.

Absorption Through the Conjunctiva. Though this is not advocated as a method of administration, it has been found by D. I. Macht[7] to be considerable. By dusting a few milligrams of apomorphine into the eye of a dog, he can produce emesis in from two to five minutes. The same result occurs from instillation of a 1 to 2 per cent. solution of apomorphine. The vomiting occurred in every case in which this experiment was tried. Using morphine, which produces emesis in dogs, emesis likewise followed instillation into the eye, although after a somewhat longer interval (five or more minutes).

These experiments point to the necessity of caution, when solutions of potent drugs are instilled into the eye. Numerous cases of cocaine and atropine poisoning from absorption through the conjunctiva are on record. The instillation of 1 drop of a 1 per cent. solution of cocaine into the eye of a 14-year-old boy produced severe poisoning. Collapse and respiratory failure were produced, in a man aged 40, by the instillation of 2 drops of a 4 per cent. solution.

Technique of Intravenous Medication. Intravenous injection is the simplest, easiest, and most satisfactory way of injecting medicaments, says E. R. Larned.[8] Veins have been injected at the same point, or very close to the same point, more than fifty times, with no unfavorable consequences of any sort. The danger of air embolism, he says, is grossly exaggerated and easily avoided. Results are much more definite and satisfactory, when such remedies as morphine, strychnine, iron, arsenic, mercury, and phenol are given intravenously than when they are given subcutaneously or by mouth. The effect is prompt, sometimes immediate, and usually may be accurately estimated. Just as the subcutaneous method is better than administration by mouth, so the intravenous injection is better than the subcutaneous.

Instruments: The very finest needles only should be used; the shaft should be no larger than 26 gauge or longer than ⅝ inch. The point should be perfect. It is far better to use a new needle every day than to risk one's reputation for skill by employing a blunt-pointed

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(7) Jour. Amer. Med. Ass'n., April 28, 1917.
(8) Therap. Gaz., October, 1916.

or rough-surfaced instrument. A very fine needle leaves no scar. The best syringe for the purpose is an all-glass syringe of 10 ml. capacity, since it is desirable in many instances to dilute the solution for injection with physiologic salt solution. A recent improvement on such syringe consists of a spring clip on the metal attachment which prevents slipping of the piston. A rubber tube and a strong artery forceps complete the instrumentarium.

The solution for injection must be clear, sterile, and made with physiologic saline, or, better, with a modified Ringer's solution, containing 0.25 gm. of calcium chloride, 0.10 gm. of potassium chloride, and 9.0 gm. of sodium chloride to 1 liter. It should be made with sterile *distilled* water and not with tap water. Such solution may be carried in small rubber-stoppered bottles. In emergencies ordinary tap water might be used without much danger, provided the proper amount of salt is added and the solution then sterilized.

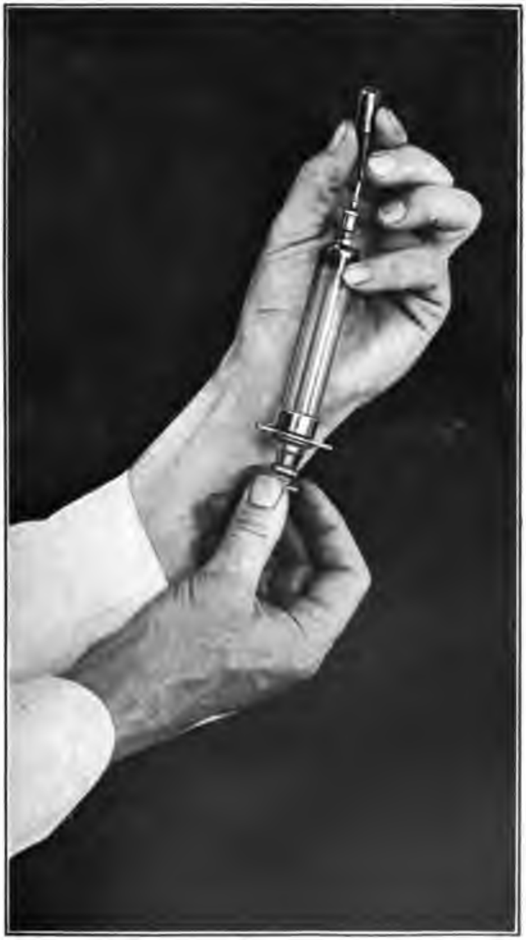
It is most convenient to obtain the medicated solution sterile and ready prepared for intravenous injection in ampoules, which are now easily obtainable in the market. The filling of the syringe from an ampoule is a very simple matter, provided one uses the little trick of inverting the ampoule, as shown in Plate I, grasping it with the thumb and first finger of the left hand, and introducing the needle just inside the broken opening. The syringe can be held firmly in the same hand by making pressure with the third or little finger, or both, against the palm of the hand. The right hand is thus left free gently to withdraw the piston. Before opening the ampoule, it is washed off with alcohol. The needle and the syringe are, of course, sterilized by boiling before use.

The technique of the injection is described by Larned as follows:

"The undressed patient, who has had no food for several hours, should be in bed, in a recumbent position, either at home or in the hospital, with no pillow under the head. A standing or sitting posture during the intravenous injection may result in syncope.

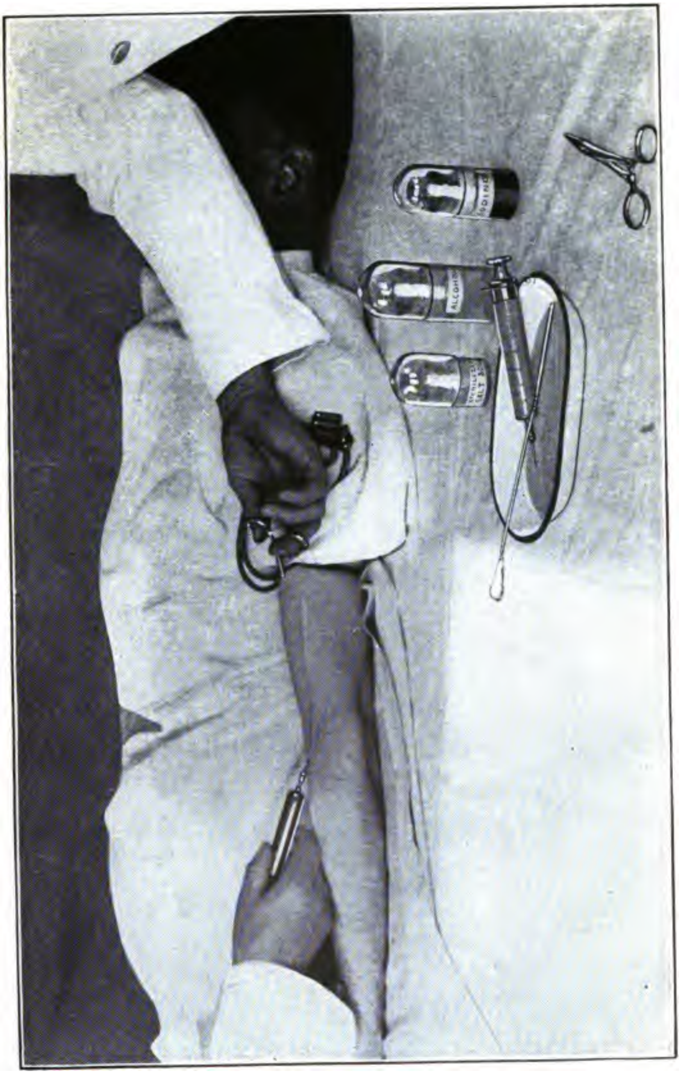
"The skin at the flexure of the elbow is thoroughly

PLATE I.



Filling the syringe from ampoule.—Larned (see page 19).

PLATE II.



Starting the injection.—Larned (see page 19).

cleansed with soap and water, followed by sponging with alcohol. The arm, just below the elbow, should be massaged firmly with a downward stroke toward the fingers, and then firm compression around the arm should be made by means of an Esmarch bandage, a rubber tube, or, if these be not at hand, a firm cotton or linen bandage may be employed. The compressing bandage should not be tied, but merely held by twisting, or by means of a strong artery forceps, so that it may be instantly loosened by the assistant or by the operator in case there is no assistant available. The object of the compression of the arm is, of course, to engorge the veins so that they may stand out prominently and so facilitate the operation, and to assist this the patient should be directed to clench the fist tightly.

"Although the median basilic vein is larger than the median cephalic, it is in close relation to the brachial artery, from which it is separated only by fascia, so that the danger of wounding the artery by an accidental transfixion of the vein with the needle suggests the advisability of choosing the median cephalic vein.

"The operator firmly grasps the arm of the patient with his left hand, seating himself comfortably at the side of the bed, or standing so that he is not in a strained position.

"With the filled syringe, from which air has been excluded, in his right hand, the operator places the shaft of the needle directly over the vein, parallel to its long axis, then points the needle toward the vein, holding it at a very acute angle to its long axis. Firmly, but gently, the point of the needle is then forced through the skin, with a lifting motion, until a sudden lack of resistance indicates to the sense of touch that the point of the needle has entered the vein. The needle should be forced through the skin and into the vein so slowly that there will be no possibility of wounding or piercing the distal wall of the vein by the added force produced by the lack of resistance when the needle pierces the peripheral wall.

"If the needle is thought to be in the vein the syringe should be held perfectly still for a few seconds, when the appearance of a small stream of dark blood running into the medicament will indicate that the needle is in the vein and everything therefore ready for the injection. Some operators withdraw the piston of the syringe slightly, to induce the entrance of venous blood into the syringe, but this is unnecessary." . . .

"When the needle is in the vein, and the operator is ready to begin the injection, he should with his right hand release the constriction or direct the assistant to do so. This should be done very carefully, however, so as not to disturb the position of the needle in the vein." "When the bandage has been released the injection should be begun, but not before."

"The piston should be forced down with a screwing motion, turning it round and round, and pushing it forward gently at the same time. This controls the speed of injection much more perfectly than is possible by holding the syringe in the ordinary manner and making pressure on the piston with the thumb and counter-pressure on the barrel with the first two fingers (Plate III). There should be the slightest possible lapse of time between determining whether the needle is in the vein and the beginning of the injection. Much delay at this juncture may result in the coagulation of the blood in the fine-caliber needle, which may be forced into the vein as an embolus when the injection is begun, a complication, of course, to be avoided.

"The actual injection of the medicament, however, should proceed with extreme deliberation and slowness, not more than 1 c.c. being injected in one minute. If more of the medicament than 1 c.c., in total quantity, is to be injected, the rate of injection should be approximately one minute to each cubic centimeter." . . .
"It is a great help to have an assistant check the time and indicate the speed of injection with the aid of a watch." . . .

"When a medicament has been injected the needle is quickly but gently withdrawn and the point of injection should be touched with tincture of iodine. It is not necessary to seal the tiny wound with collodion, although some operators prefer to do this.

"The patient should remain in bed in a recumbent position for an hour or two after the injection so as to disturb the cardiovascular system as little as possible. It is good practice for the physician to remain in attendance for perhaps an hour after the injection, or until all likelihood of any reactionary symptoms has passed.

"In the aged, when the patient is weak or his condition bad, some stimulation at the time of injection is good practice. One-thirtieth grain of strychnine subcutaneously, or other stimulants, may be given as required.

"It is the author's opinion that intravenous injections should never be given in the physician's office. The application of medicaments by the intravenous route, while a simple and almost uniformly satisfactory procedure, should not be lightly undertaken, but approached with due respect to the cardiovascular system." . . .

"The author has made hundreds of intravenous injections and has yet to find an instance where it was necessary to resort to exposure of the vein. If for some reason, as adiposity, veins at the bend of the elbow can not be engorged sufficiently to make them prominent enough for the purpose, then a vein on the back of the hand, on the dorsal surface of the foot, in front of the internal malleolus, or on the anterior surface of the leg, may usually be found sufficiently prominent."

Preliminary injection of cocaine is utterly absurd and entirely unnecessary. A properly made intravenous injection is less painful than the ordinary hypodermic injection.

Of course, after using, the syringe, including the needle, is rinsed with sterile water and finally with alcohol, before returning the instrument to the case.

[While it is desirable that the patient be in bed at home or in a hospital, thousands, yea tens of thousands of intravenous injections are now being given daily at physicians' offices, without disastrous results.—Ed.]

Intraspinal Administration: Subarachnoid Medication. The importance of the principle of applying drugs as directly as possible to the seat of the disease is nowhere better illustrated than by the intraspinal administration of drugs.

First employed for cocainization of the spinal cord, as suggested by Corning (1885) and made practicable by Bier (1899), its disadvantages and dangers, which are greater than those of general anesthesia, have relegated this form of anesthesia to merely exceptional use. It was next advocated for the administration of tetanus antitoxin by Rogers (1905), Park (1910), Park and Nicoll (1914), Dreyfus (1914). It has become the method of choice for the administration of antimeningococcus serum in epidemic cerebrospinal meningitis, inasmuch as the action of this serum is chiefly local. Owing to the comparative ineffectiveness of the ordinary administration of salvarsan and of mercury in syphilis of the central nervous system, direct spinal injection of these drugs has been introduced (Swift-Ellis salvarsanized serum, 1913; Byrnes, mercurialized serum, 1914), and, it is alleged, has scored success.

The reason for resorting to this rather troublesome and heroic method of administration lies in the fact that but little of drugs introduced into the system is eliminated into the cerebrospinal canal. This seems to be true not only for arsenic (Camp, 1912) and mercury (Gilpin and Earley, 1916), but even for as diffusible a substance as iodide, which J. H. Catton[9] was unable to find in the spinal fluid, no matter how large an amount of iodide was administered by mouth, thus confirming the claim made by Swift and Ellis in 1912.

According to experiments by E. E. Goldmann, injection of dyes into the spinal subarachnoid space stain the spinal cord, the brain stem and optic nerves, but not the cerebellum, the cerebral hemispheres and the other cranial nerve roots. Hence one must infer that medicament introduced by lumbar puncture would not readily affect the cerebral hemispheres or cerebellum. When this is desired, injection into the cranial subarachnoid space would have to be made; as has been advocated in injection of antitetanus serum in the treatment of tetanus, and injection of salvarsan into the lateral ventricle in the treatment of paresis.[1] Inasmuch as brain syphilis affects chiefly the basal structures,

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(9) Jour. Amer. Med. Ass'n., Nov. 4, 1916.
(1) Page 27, this volume.

which are reached by spinal subarachnoid injections, the treatment of most cases of cerebrospinal syphilis in this manner seems well founded.

However, spinal puncture has its dangers and disagreeable possibilities. Failure of asepsis in technique may result in cerebrospinal meningitis and death. The so-called Puncture Headache, described by Charles L. Dana[2] is a very common sequel of lumbar puncture. It usually begins the day following the puncture, but may come on later; it may be accompanied by nausea, vomiting, dizziness, mental confusion and faintness. The symptoms are brought on and aggravated by exercise, and are relieved by recumbency; the flatter the patient lies the better he feels. The headache is due to a disturbance in the pressure relations in the cerebrospinal fluid, probably due to a perversion of the secretion from the chorioid glands. It is possibly prevented by avoiding sudden or marked pressure changes in the cerebrospinal canal. Puncture headache is most liable to occur when normal pressure conditions existed within the canal before the puncture. On the other hand, when the pressure is high, puncture often relieves headache. Dana suggests that perhaps a good many other headaches are due to defective function of the chorioid glands, and that it might be those headaches in which the patient is more comfortable when he lies down and which are aggravated by physical and mental exertion, that might have a similar pathology to that of puncture headache. Puncture headache is not likely to occur when an injection is made after withdrawal of an equivalent amount of fluid.

Lumbar Puncture Rendered Painless. Lumbar puncture is made painless and much simplified, according to W. Broadbent[3] by injecting a syringeful of eucaine and adrenalin solution under the skin at the selected site, and also down between the arches of the vertebrae, in adults as deeply as the hypodermic needle will reach, in children, of course, not far enough to risk entering the spinal canal. After waiting five minutes, lumbar

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(2) Jour. Amer. Med. Ass'n., April 7, 1917.
(3) Brit. Med. Jour., October, 1916, p. 586.

puncture can be done painlessly and without movement on the part of the patient.

Intraspinal vs. Intravenous Injections. "Intraspinal injections have failed to produce results superior to those obtained by the intravenous method," is the assertion of Bernard Sachs;[4] and inasmuch as serious results, such as paralysis and vesical disturbance, have often enough followed the intraspinal method, and even life is sometimes actually endangered, he holds that this method should be abandoned.

"In a large number of cases of tabes in which the patients had received numerous intraspinal injections without distinct improvement, a satisfactory result was obtained when intravenous treatment was given by our intensive way, by which I mean intravenous injections of 0.3 or 0.4 gm. of salvarsan repeated every three or four days until the patient has had from fifteen, twenty or even fifty injections. A similar number of lumbar punctures for the purpose of intensive treatment would necessarily prove most disagreeable, if not harmful, to the patient; but beyond all these facts it has been definitely ascertained that the serious forms of general paresis or of tabes dorsalis have not been favorably affected by intraspinal injections, and nothing has been accomplished by them that could not have been achieved by the intravenous method."

The author believes that he and his associates have been able to detect salvarsan in appreciable quantities in the spinal fluid, when it is introduced in the usual quantities into the blood current. When, on the other hand, a metallic substance like salvarsan is introduced into the spinal canal, it does not remain in the cerebrospinal fluid for any length of time, but is rapidly absorbed into the venous system. It has been shown that the cerebrospinal fluid circulates very imperfectly and that the natural course of this fluid is not favorable to the absorption of substances from the cerebrospinal fluid by the cells of the cortex.

The present-day remedies are to some extent inefficient in the teatment of syphilis of the central nervous system because they do not possess the neces-

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(4) Jour. Amer. Med. Ass'n., Sept. 1, 1917.

sary solubility to allow them to pass through the blood-vessels into the brain substance. The problem for the future is to find some more diffusible remedy, lipoid-soluble and less toxic than salvarsan that will be able to pass through the blood-stream into the tissues of the brain through the chorioid plexus into the spinal canal and attack the foci of spirochetes wherever they may happen to be located.

[That is a thing devoutly to be wished for; but probably impossible, as will be realized from the fact that, in elaborating salvarsan, Ehrlich aimed at a substance with minimum organotropic coupled with maximum parasitotropic activity. Making a poison more diffusible and lipoid-soluble would endow it with greater organotropic action, therefore greater toxicity.—Ed.]

Injection Into the Lateral Ventricle. In the treatment of paresis, injections of salvarsan into the lateral ventricle were employed with alleged excellent results in the early stages by G. M. Hammond, N. Sharpe and J. W. Smith.[5] They state that it does not appear to have any effect in even retarding advanced cases. They believe that if it is employed before serious changes have taken place in the cerebral structures it holds out the best hope of improvement, and perhaps permanent stoppage, of the disease that we know of today.

The preparation of the serum will be discussed later in this volume.[6] The operation consists in making, under ether anesthesia, a ⅜-inch trephine opening, and incising the dura so as to obtain a clear view of the cortex. A point free from vessels is selected for the introduction of the ventricular cannula, thus avoiding all danger of cortical hemorrhage. At first, cerebrospinal fluid is permitted to escape slowly, and then the serum is introduced slowly, entirely by means of gravity. Subsequent injections can be done under local anesthesia, the scalp being infiltrated over the original trephine opening. The authors insist upon the necessity of incision of the scalp and inspection of the cortex before introducing the ventricular cannula, as only by so doing can cerebral hemorrhage be avoided.

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(5) Jour. Amer. Med. Ass'n., July 7, 1917.
(6) Page 82.

Beginning with 0.6 mg. of salvarsan in the first case, the authors have gradually increased the strength of the serum until now they are giving 1.2 mg. It has been their custom to give a second injection a week or ten days after the first, and the third injection two weeks later. They urge that this form of treatment be universally adopted in the early stages of the disease.

In an earlier paper (1915), the authors have shown, by experiments upon animals, that fluid introduced into the ventricle reaches all portions of the cortex of the brain and cord and has a much greater spread and diffusion than one introduced by any other method.

Serum as Vehicle for Injections. One of the most interesting and important recent advances has been in the direction of using serum as a vehicle for irritant drugs, such as mercuric chloride or salvarsan, for the purpose of injection. It is possible thereby to minimize the local irritant action of these drugs. Inasmuch as this method of administration might be found useful for other substances as well, it seems advisable to discuss this subject here quite thoroughly.

F. E. Stewart[7] notes that mercurialized serums are prepared by adding corrosive sublimate to normal serums and dissolving the precipitate thus formed by an excess of serum. The advantage of using mercurialized serum lies in the fact that it produces no irritation when injected subcutaneously, intramuscularly, intravenously or intraspinally, while corrosive sublimate is a violent irritant. The reason for this lies in the fact that the local irritant action of mercuric chloride lies chiefly in its proteid precipitating power, which is completely neutralized when we use mercurialized serum.

We must distinguish between medicated serums produced from the blood serum of the patient (autogenous serum) from the blood serum of some other human being (homologous serum), or from the blood serum of an animal from some other species (heterologous serum). When heterologous serum is employed, we run the danger of serum sickness and anaphylaxis, which is not great from subcutaneous or intramuscular admin-

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(7) New York Med. Jour., Jan. 20, 1917.

istration, so that heterologous mercurialized or other medicated serums might be employed by these routes, using the same precautions that are employed in the administration of other therapeutic sera: namely, avoiding the administration of horse serum preparations in asthmatic individuals; making the second serum injection within a week of the previous one; and, in case of doubt, giving a few drops of the serum subcutaneously and, if there is no reaction, administering the remainder of the dose in about an hour.

Mercurialized Serum. This is now described in New and Non-Official Remedies[8] as a solution of mercuric chloride in normal horse serum, diluted with physiologic sodium chloride solution. It is marketed by the H. K. Mulford Company of Philadelphia in 30 ml. ampoules, each containing a dose of 0.0013 gm. of $HgCl_2$, which may be used as an initial dose, to be increased later to double the amount, packages containing which are also marketed. Each package contains rubber tubing and intraspinal needle.

According to F. E. Stewart,[9] Byrnes, to whom belongs the credit of having introduced intraspinal injection of mercurialized serum in the treatment of cerebrospinal syphilis, has adopted the use of horse serum for this purpose. "So far as we know, no cases of anaphylaxis have followed its intraspinal injection; and, as a large number of patients has been treated with the serum, it is safe to assume there is little risk of anaphylactic phenomena when it is used in this way."

Formula for Intravenous Injection. L. Thompson,[1] the originator of intravenous injections of mercurialized serum, advises the use of autogenous or homologous serum in order to avoid the serious danger from anaphylaxis on intravenous injection. He gives the following directions for preparation of such serum: "From 40 to 50 c.c. of blood are collected by venepuncture and placed in a large test tube which has been boiled in salt solution. After separation the serum is poured off and thoroughly centrifugated. A watery solution of mer-

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(8) 1917 Edition, p. 187.
(9) Loc. cit.
(1) New York Med. Jour., Jan. 20, 1917.

curic chloride is prepared so that each cubic centimeter contains .022 gm. of the salt. The serum is now measured and divided into two parts, one-third of the amount placed in one tube, and the remainder in another. The mercury solution is added to the first part in the proportion of 1 c.c. to each 2 c.c. of the serum. A heavy precipitate of albuminate of mercury appears, which is completely dissolved on the addition of the remainder of the serum. It will be seen that the mixture will contain .022 gm. of mercuric chloride in each 7 c.c. At first great difficulty was encountered in keeping the albuminate of mercury in solution for any length of time, and it was necessary to prepare the solution fresh before each injection; but later it was discovered that, if the mixture be heated in the water bath for one-half hour at 55° C., it will remain in solution indefinitely. Recently I have used ascitic and hydrocele fluids in the preparation of mercurialized serum for intravenous injection with very favorable results. These fluids, however, vary somewhat in their ability to hold mercury albuminate in solution, some of them requiring as much as 10 c.c. to each 0.022 gm. of the bichloride. Of course, ascitic and hydrocele fluids should be tested for the presence of tubercle bacilli before using them for intravenous injection.''

Thompson does not advise the intravenous use of mercurialized serum as a routine treatment of syphilis, but mainly in those cases in which the pain of the intramuscular injection is so great that the patient would not tolerate it.

The Toxicity of Mercurialized Serum and of Bichloride of Mercury. The two drugs were compared by Pittenger[2] by means of experiments upon dogs. He arrived at the conclusion that, no matter whether administered intramuscularly, intravenously or intraspinally, the toxicity of the two is the same, excepting that local irritant action is much less in case of the injection of the protein combination. That this is also true of gastric administration has been shown by Fantus.[3] Pittenger concludes that, inasmuch as intramuscular and

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(2) New York Med. Jour., Jan. 27, 1917, p. 161.
(3) Jour. Lab. and Clin. Med., September, 1916, p. 879.

subcutaneous injections of mercurialized serum are practically painless and are not followed by sensitiveness, pain, and sloughing, which usually accompany injections of the plain bichloride, mercurialized serum injections should be preferred to injections of irritant mercurials. He cites a number of cases of syphilis treated satisfactorily by means of such injections; and describes one successful case, in which hypodermic injections of serum containing 0.005 gm. of mercury were given three times a week, later increased to 0.010 gm. twice a week, with remarkably good results within two months. Pittenger also endorses L. Thompson's (1915) suggestion to use mercurialized serum for intravenous injection; and that of C. M. Byrnes (1914) to use it for intraspinal administration.

Salvarsanized Serum for Intraspinal Treatment of Neuro-Syphilis. This is prepared according to Ogilvie's modification of the Swift-Ellis method described by W. C. Stoner,[3] as follows: "Fresh blood serum is taken from the patient on the day of the injection, from 0.25 to 0.75 mg. of salvarsan, arsenobenzol or diarsenol is added, and it is placed in a water bath at 37° C. (98.6° F.) for forty-five minutes and then 56° C. (132.8° F.) for thirty minutes. The usual quantity of serum so treated is 10 c.c.; it is injected into the spinal canal by replacing an equal quantity of cerebrospinal fluid." "With experience one feels no greater risk in giving intraspinal treatment than intravenous." "No patient with early syphilis should be dismissed as tentatively cured on a blood reacting negatively to the Wassermann test." A lumbar puncture is also required. "A positive lumbar puncture is indication for intraspinal treatment, even though there are no definite clinical signs of such involvement, such as nervous irritability or head pains." "It is striking how much relief a single intraspinal treatment will give in early neuro-syphilis when general treatment has failed." These quotations from various portions of the article will give the reader an idea of the indications for intraspinal injections of salvarsanized serum, as drawn by Stoner.

Very satisfactory results in the treatment of syphilis

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(3) Jour. Amer. Med. Ass'n., Feb. 24, 1917.

of the central nervous system were obtained by Walker and Haller[4] by treating them according to the following rule: "Patients are first treated with intravenous salvarsan. If satisfactory results do not follow three or four such treatments, they are then given intraspinal salvarsanized serum in conjunction with intravenous salvarsan. Those who have a negative reaction in the serum are given only intraspinal salvarsanized serum."

Solution for Injection into the Lateral Ventricle. G. M. Hammond, N. Sharpe and J. W. Smith[5] add salvarsan or neosalvarsan to 40 per cent. serum in 0.9 per cent. sodium chloride solution. The method of preparation is as follows: "Blood, to the quantity of from 40 to 60 c.c., is drawn by means of suction from a vein at the bend of the elbow into a sterile needle and tube. The blood is usually drawn late in the afternoon of the day before that set for the treatment. The blood is incubated at 27° C. over night. It coagulates and the clot contracts. On the following morning there is usually more than enough perfectly clear cell-free serum available, which is easily removed from the tube by means of a bulb pipet. Twelve cubic centimeters of the serum are transferred directly to a graduate, 18 c.c. of sodium chloride solution are added (making a total volume of 30 c.c. of a 40 per cent. serum), and the graduate is immersed in a water bath at 56° C. for thirty minutes. Inactivation destroys complement, serum enzymes and vegetative microörganisms. There should be none of the latter. Any one who prepares serum should be certain of his technique. After inactivation the serum is kept on ice until called for. Just before use it is medicated by the addition of salvarsan or neosalvarsan. The quantities used are fractions of a milligram, from 0.6 to 0.9. A few doses of 1.2 mg. were given with no untoward effects."

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(4) Archiv. Int. Med., September, 1916, Vol. 18, p. 376.
(5) Jour. Amer. Med. Ass'n., July 7, 1917.

ETIOTROPIC THERAPY.

ANTISEPTICS AND DISINFECTANTS.

[The search for the ideal antiseptic has been greatly stimulated as well as aided by the terrible catastrophe in Europe. Before we enter upon a discussion of the substances that have recently been used for this purpose with alleged good results, it is necessary for us to bear in mind that many of them agree among themselves in one respect, namely that they are employed in baths, irrigations or moist dressings. That continuous irrigation with or immersion in water is of great value in the treatment of wounds is ancient knowledge. The question is whether the addition of a chemical is of advantage; and, if so, which one is the best.

It is evident that the general tendency at present is to abandon the brief application of powerful and poisonous disinfectants, which may harm the tissues more than the miscrobes, in favor of the continuous employment of comparatively innocuous agents. Surgeons seem to have learned the lesson that antiseptics, *i. e.,* agents capable of inhibiting the growth of microörganisms in doses harmless to the tissues of man are of value only when left in *prolonged* contact with the infected part. Brief application of antiseptics is useless. When will medical men come to realize this truth?—Ed.]

Chlorine Preparations. Solution of hypochlorite of sodium was introduced in 1820 by Labarraque, an apothecary of Paris. It is official in the United States Pharmacopoeia and has been for a long time under the name, "Solution of Chlorinated Soda" (Liquor Sodae Chlorinatae). This solution is alkaline in reaction. An improvement of this solution was made by Dakin in 1915 by neutralization, so that it no longer gives a red color with phenolpthalein, and its preparation was further improved by Daufresne. This solution has been introduced into "New and Non-Official Remedies" (N. N. R.) under the name *"Neutral Solution of Chlorinated Soda"* (Dakin's Solution, Carrel-Dakin Solution).

A. Carrel, who was the first to subject this solution to the clinical test, describes its preparation in detail in a letter to the editor, published in the *Journal of the American Medical Association,* Dec. 9, 1916. It is claimed that this solution is as germicidal as Labarraque's solution; but, because of a slight degree of alkalinity, is much less irritating to the tissues. It does not coagulate or precipitate protein. On the contrary, it has a solvent action on fibrin. This action, which makes it of value as a cleansing agent for wounds, might cause secondary hemorrhage, as well as delay in healing, by preventing the agglutination of the wound surfaces with each other. Hence its use is discontinued as soon as bacteriologic examinations of the discharge have shown the wound to be practically sterile. Its chief disadvantages are that it is quite unstable, and very irritating to the skin when applied for a long time.

Carrel's Method of Disinfection of war wounds is described in detail in articles by H. H. M. Lyle[1] and W. O'Neill Sherman.[2] It consists of mechanically cleansing the wound, leaving it wide open, and introducing tubes into it by means of which instillations of Dakin's solution are made every two hours, using on the average about 10 ml. for an ordinary wound. The aim of the treatment is to maintain the antiseptic in constant contact with the surgically prepared wound for a prolonged period. The skin surrounding the wound is protected from the liquid by means of petrolatum-impregnated gauze. As soon as the wound has been found sterile on three successive days it is sutured. Results are reported to be excellent.

Some doubt is cast upon the antiseptic value of Dakin's solution by Kenneth Taylor,[3] who found this solution quite deficient in antiseptic power against *Bacillus pyocyaneus* as well as against *Bacillus aërogenes capsulatus* and *Staphylococcus aureus,* as shown in the tables (page 45).

P. Delbet[4] claims that wound secretion mixed with Dakin's or Labarraque's solution really makes a better culture medium than without it.

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(1) Jour. Amer. Med. Ass'n., Jan. 13, 1917.
(2) Ibid., July 21, 1917.
(3) Jour. Amer. Med. Ass'n., Nov. 25, 1916.
(4) Jour. Amer. Med. Ass'n., Paris Letter, Feb. 12, 1916.

From the clinical standpoint, doubt as to the value of any antiseptic is expressed by A. U. Desjardins,[5] who says in an article entitled "Wounds in War and Methods of Treatment": We divided the patients into series of ten, and treated the patients in each series with a different antiseptic solution, such as Dakin's, Wright's hypertonic saline, iodine solutions of different strengths, acetic acid solution, and bicarbonate solution, with control cultures twice a week. The results failed to show any distinct difference in the power of the different antiseptics used to shorten infection and hasten granulation—when the wounds were properly drained the infection soon subsided—but they did show that *continuous irrigation, while of distinct value during active suppurating stage of the wound, should then be discontinued and dry dressings substituted.* Prolonged continuous irrigation seems to have a tendency to produce edematous flabby granulations, and to retard the healing process.

Principles Underlying the Production of Harmless Irrigating Fluids. This subject is discussed by J. F. McClendon,[6] who points out that, owing to the prolonged contact required, the antiseptic properties of the irrigating fluid must be subordinated to its physiologic properties. Apart from the chlorine or other antiseptic in the irrigating fluid, it should be physiologically normal. Hence, for one thing, iosotonicity is of importance. Were the chlorine, for instance, dissolved in distilled water, the water would injure the tissues without affecting the bacteria. But hypertonic solutions should also be avoided. Various samples of Dakin's fluid were found by this author to have a freezing point of from —0.7 to —0.9° C., while the freezing point of human blood is —0.56° C. Dakin's fluid is therefore very hypertonic. The salts in the fluid should be properly balanced, so as to approximate serum in its diffusible constituents as closely as possible. It is furthermore very important that the hydrogen ion concentration; that is, the alkalinity (or acidity) of the fluid should not exceed certain limits. Expressed in terms

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(5) Jour. Amer. Med. Ass'n., Jan. 6, 1917.
(6) Jour. Lab. and Clin. Med., August, 1917.

of the minus logarithm of the hydrogen ion concentration, the PH of a neutral solution is about 7, whereas that of the blood is 7.5 and that of sea water about 8. The extreme limits of the variation of the PH that is compatible with life of most cells is from 5 to 9, and the majority of cells do not bear variations beyond 6 to 8.

Bearing all these considerations in mind, the author advocates a solution containing: 1.25 per cent. $NaHCO_3$, 0.04 per cent. KCl, 0.02 $CaCl_2$, 0.025 per cent. $MgSO_4 . 7 H_2O$ and 0.01 per cent. NaH_2PO_4. A brown glass bottle is filled with this solution and inverted in a basin of the solution, and chlorine gas (which may be obtained in sealed tubes now on the market) is passed into the bottle through a glass tube until it displaces more than half of the solution. The tube is removed, the stopper inserted, and the bottle shaken so that the solution will absorb the gas, the stopper being lifted occasionally so as to admit air in the space from which the gas has been absorbed. The solution is then titrated to bring it to the strength recommended by Dakin and Carrel; that is, 0.45 per cent. to 0.5 per cent. When 10 ml. of this solution are added to a flask in which had been placed a few crystals of potassium iodide and about a cubic centimeter of hydrochloric acid, it should require from 12.7 to 14.1 ml. of N/10 sodium thiosulphate solution to discharge the color of the iodine. If the solution is found too strong, it is diluted with gas-free solution. The PH of the fluid is then determined by means of suitable indicators (discussed in the article), and lowered by bubbling carbon dioxide through, or raised by bubbling air through it. The PH should not be allowed to exceed the limits 5 to 7.5 unless it is desired to irritate the tissue.

In order to prevent the absorption of bacterial toxins from the wound, Wright advocates the use of very hypertonic (5 per cent.) sodium chloride solution. Such solution is, however, irritating to the tissues. Hence McClendon suggests a continuous rectal irrigation to be used simultaneously with the irrigation of the wound with isotonic Dakin's fluid; for, by the administration of large quantities of water, absorption of an isotonic irrigating fluid can be minimized.

Dakin's fluid, made with the precautions discussed, has been tried on large wounds in dogs and men. Not sufficient data have been collected to show that these precautions were really always worth the trouble; but, on the other hand, no disadvantages of such a solution have been noted.

Chloramin-T (Chlorazene) N. N. R., which is sodium para-toluenesulphonchloramine, introduced by H. D. Dakin in 1915, was described by Cohen and Kenyon[7] in 1916. It is introduced as a convenient means of obtaining chlorine disinfection of wounds. It is a fairly stable white solid of faint chlorous odor and bitter taste, freely soluble in water; its saturated aqueous solution containing about 15 per cent. of the salt. Such solution, faintly alkaline in reaction, is non-corrosive [though very irritant—ED.], and does not precipitate or coagulate protein. While practically non-toxic, guinea-pigs and rabbits tolerating [sometimes—ED.] as much as 1 gm. per kg. given subcutaneously [but producing necrosis at the point of injection—ED.], it is claimed to possess intense germicidal action. Dakin found it as powerful a disinfectant as an equal weight of sodium hypochlorite, much more stable and much less irritant, so that it may safely be used in from five to ten times as great a concentration. When brought in contact with protein, it is decomposed, yielding its chlorine to the basic (NH_2) groups, thereby developing its antiseptic action. As chlorazene is a highly reactive substance, it should not be mixed with other antiseptics, *e. g.,* alcohol as well as hydrogen peroxide decompose it.

Chlorazene has been used in from 1 to 4 per cent. solution for continuous application and intermittent irrigation of infected wounds, just like the neutral solution of sodium hypochlorite, and has given similar, although it is claimed, better results. Being much less offensive than the hypochlorite, it is advocated and used in 1 to 2 per cent. strengths as a mouth wash in septic mouth cases. Solutions of 0.5 per cent. strength have been used, with alleged success, for bladder and uterine and urethral irrigations; for the latter purpose, the strength having gradually been increased to 2 per

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(7) Brit. Med. Jour., Jan. 29, 1916.

cent. It is suggested that solution of chlorazene be used for moistening of gauze packing for infected wounds.

[In advancing dichloramin-T, page 39, Dakin furnishes us with an insight into the disadvantages of the chlorine preparations just described.—Ed.]

Thymol as a Mouth Antiseptic. Thymol was found better than chloramin-T and other agents tested by Helen P. Goodrich,[1] who experimented with the effect upon mouth bacteria of various antiseptics. Boric acid was found disappointing. Iodine, while an excellent antiseptic in solution as dilute as 1:3000, is not pleasant enough to serve as a mouth wash for general use; though, in the hands of the dentist, it is likely to be very valuable. As hypochlorites and chloramin-T are believed to attack the teeth, and have an unpleasant taste, they are unsuitable for use as mouth antiseptics. Hydrogen peroxide is too readily reduced, and potassium permanganate is not only feeble, but also stains the teeth. Zinc sulphocarbolate, even in 10 per cent. solution, is not an active disinfectant. Emetine in 0.5 to 1 per cent. solution does not kill *Entamoeba gingivalis* after twenty or forty minutes. Emetine is also a poor germicide, a 1 per cent. solution giving no better results than a saturated solution of boracic acid. Harmine hydrochloride was found to have a much greater amebicidal effect: a 0.5 per cent. solution killing amebas instantly. Its germicidal action is, however, very poor, and it is too poisonous to be used within the mouth.

A saturated aqueous solution of thymol, permitted to act for one-half minute or longer, almost invariably killed all the bacteria. After only a quarter of a minute's action of the thymol there were always two or three colonies. A saturated solution had more effect in one minute than a half-saturated one had in four minutes (inverse squares of concentration). A saturated solution of thymol has a [comparatively—Ed.] pleasant taste, causing a temporary burning sensation and stimulating a flow of saliva. For ordinary use, a saturated solution may be readily prepared by putting a lump of thymol (solubility 1:1,500) into a bottle of cold or

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(1) Brit. Med. Jour., April 14. 1917.

warm tap water; the water must not be hot, for thymol melts at 51.5° C. It should be allowed to stand for some hours, and should preferably be shaken occasionally. As the solution is used, the bottle may be filled up with water. In traveling, and especially in military service, nothing more convenient as a dentrifice or mouth wash can be imagined than a lump of thymol in a small bottle to be filled with water as occasion requires. If more generally used, it would put an end to the distressing gingivitis and pyorrhea so often following neglect of the teeth during a sojourn in the trenches.

"In cases kept under observation (some for more than a year), in which this solution has been used at least every night, the growth of leptothrix as well as of the bacteria that can easily be cultivated artificially has been very much diminished, so that there is practically no accumulation of tartar. In cases of pyorrhea, where the gums are too sore for even a soft brush to be used, they should be massaged with the fingers and then well washed with the solution, some of which should be retained in contact with the gums for some minutes. An antiseptic solution is much to be preferred to a paste or powder. These latter, owing to the necessary presence of some gritty substance, such as chalk, tend not only to injure the gums, but also to clog the 'pockets'—a most undesirable result."

Dichloramin-T. This is para-toluene-solphondichlormine (first prepared by Kastle, Keiser and Bradey) and is a white powder of chlorinous odor, practically insoluble in water, suggested by Dakin[2] and his collaborators as a means of overcoming the two objections to the soluble chlorine compounds just discussed; namely, instability of solution, so that the compound loses its effect soon after having been applied to the wound, hence requiring frequent and therefore troublesome reapplication; and irritation of the skin on prolonged treatment. When this substance is dissolved in organic solvents, such as liquid petrolatum or eucalyptol, it gives up a portion of its chlorine to these, unless the liquid is previously chlorinated. By dissolving from 5 to 10

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(2) Jour. Amer. Med. Ass'n., July 7, 1917.

per cent. of it in equal parts of chlorinated eucalyptol and chlorinated liquid petrolatum, a fairly stable solution is obtained, which gives off chlorine slowly for from 18 to 24 hours, hence does not have to be re-applied oftener than once a day. After careful surgical preparation of the wound, the liquid is simply applied in form of a spray; or, if the wound is deep, the cavity is filled with the liquid. Only a few layers of gauze should be used to cover the wound, so as to avoid absorption of the oil by the dressing. Among the advantages claimed for this method as compared with the Carrel-Dakin technique, are: simplicity of technique, saving in dressing material (less than one-third), greater rapidity of healing (by 16.3 per cent.) and the possibility of using dependent drainage.

[It is of interest to compare this method with the use of iodoform-bismuth-petrolatum paste, described on page 43.—Ed.]

Disinfection of the Nose. E. K. Dunham and H. D. Dakin[3] advise that the nose be first cleared with salt solution or with 0.25 per cent. aqueous solution of chloramin-T either by spraying or irrigation. The nose should be blown into a handkerchief between applications; and the chloramin-T solution should be used thoroughly as a gargle. When the increased flow of secretion from the nose has subsided, the oil solution of dichloramin-T is applied with an oil atomizer. The oil spray should be repeated at intervals, so as to make at least four treatments daily about equally spaced from each other. The spraying should be thorough and the oil carried to all parts of the membrane accessible. The first few applications of the oil sometimes occasion sneezing, but tolerance is soon acquired and subsequent applications cause no inconvenience.

The following formula is given for the preparation of the spray solution: 0.2 gm. of dichloramin-T is dissolved in 2 ml. of chlorinated eucalyptol without heating; then 8 ml. of chlorinated paraffin oil are added. After mixing, the solution is ready for use. It is relatively unstable and should be discarded as soon as a distinct

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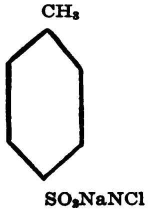
(3) Brit. Med. Jour., May 26, 1917.

precipitate (not mere cloudiness) appears. It should be kept dark and cool, and for not more than three or four days. A 10 per cent. solution of dichloramin-T in chlorinated eucalyptol may be kept in stock for a month, and diluted with the paraffin oil, 1:4, as required. quired.

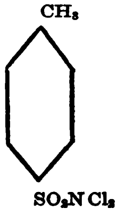
With such a spray, it has been found possible to render the naso-pharynx sterile for aërobic bacteria in a few hours. Subsequently bacteria reappear from the dust, etc. Thus far only a small number of tests on carriers of the meningococcus have been made, but the results as noted by S. Flexner[4] are promising.

Disinfection of Drinking Water. For this purpose, halazone has been advanced as the best yet found by Dakin and Dunham.[5] This substance, which is p-sulphondichloraminobenzoic acid, is closely allied to chloramin-T and to dichloramin-T, the substances just discussed. The structural formulae will best show their relation to each other:

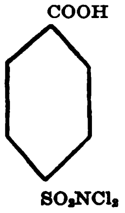
Chloramin—T
(Chlorazene)



Dichloramin—T



Halozone



The parent substance of halazone, p-sulphonaminobenzoic acid, is related to saccharin, which is ortho-sulphaminobenzoic acid, and will probably be found as harmless. Halazone is a white powder of mildly chlorinous odor, slightly soluble in water, more soluble in alkaline liquids. It is claimed that 1:300,000 sterilizes water in about 30 minutes; and that a tablet containing 4 mg. of halazone, and a similar amount of sodium carbonate, suffices to sterilize 1 liter of water.

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(4) Jour. Amer. Med. Ass'n., Sept. 1, 1917.
(5) Brit. Med. Jour., May 26, 1917.

[The taste of water containing one such tablet per liter is entirely unobjectionable; and, if all the claims made are fully substantiated by subsequent research, this substance promises to become of considerable importance, particularly as part of the equipment of soldiers. —Ed.]

Dusting Powder for Wounds. A simple and probably highly efficacious dusting powder for wounds is described by H. Vincent.[6] It has the following formula:

Calcium hypochlorite	10 parts
Boric acid	90 parts

The ingredients are pulverized separately, mixed very carefully, and kept dry in a colored bottle. The powder is applied at once, after thorough mechanical cleansing, by pouring it freely into all the crevices of the wound; it seems to be perfectly tolerated by the tissues and to favor cicatrization. As the powder is not very soluble, its action continues for some time. Vincent has found it a most potent prophylactic of infection in military practice.

Iodine Preparations. Iodine was found the most harmless antiseptic by R. A. Lambert[7] in a study, in which the effect of the chemical upon cultures of human connective tissue cells was compared with that on staphylococcus cultures. Iodine was the one chemical to which the cells were more resistant than the bacteria. Lambert obtained a good growth of connective tissue cells after exposure to 1:2000 solution of iodine for one hour, an exposure sufficient to kill staphylococci. Hence, it is not probable that, in such strength, iodine would injure the tissues. It is, however, liable to exert an unfavorable effect upon wound healing by its power of dissolving fibrin, resembling in this respect the hypochlorites (Dakin's solution). The other chemicals tested (potassium cyanide, phenol, tricresol, hydrogen peroxide, alcohol and, to a certain extent, mercuric

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(6) Bull. de l'acad. de méd., Jan. 30, 1917.

(7) Jour. Exp. Med., December, 1916; see also Practical Medicine Series, 1917, Vol. I, p. 19, and Vol. II, p. 55.

chloride) were more detrimental to the tissue cells than to the bacteria.

In view of these experiments, the following preparation is of considerable interest:

Iodoform-Bismuth-Paraffin Paste. This was first used by Rutherford Morison, and has been studied chemically and bacteriologically by H. Chambers and J. N. Goldsmith,[8] and clinically by L. G. Anderson and H. Chambers.[9] The composition of this paste is as follows:

Iodoform	2 parts
Bismuth subnitrate	1 part

Liquid petrolatum, enough to make a soft paste of the consistency of soft butter or of thick cream.

While this paste sterilizes staphylococcus cultures after 24 hours' incubation, pastes of bismuth subnitrate, or of iodoform, alone have no action. It is evident, therefore, that the effect is due to the iodine liberated by the nitric acid split off by hydrolysis from the bismuth subnitrate. The presence of oxygen is necessary for this reaction to take place.

After thorough mechanical cleansing of the wound, if necessary under anesthesia, it is swabbed out with alcohol; and then a little of the paste is vigorously rubbed into the tissues, a small portion being left in the bottom of the wound, which is then closed with interrupted stitches and dressed with gauze wrung out of alcohol. The wound does not need to be dressed again for from seven to fourteen days. While the paste maintains continuous antiseptic action, it does not interfere with the growth of granulation tissue. It also acts as a lymphagogue, producing a free exudation, which effectually washes the wound. As it does not prevent escape of discharge, drainage tubes or gauze drains are unnecessary. In a total of 400 cases, a large number of which were severe wounds, only one case of secondary hemorrhage occurred. Septic wounds heal nearly as rapidly as non-infected ones; and bone union is rapid. One case of iodoform poisoning occurred, when the use

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(8) Lancet, March 3, 1917.
(9) Ibid.

of the paste was in its infancy and larger quantities were employed. No case of gas gangrene or tetanus developed under this treatment, even though cultures taken from the wounds under treatment showed a large number of these infected with the organisms producing these diseases. The wounds do not become sterile under this treatment, though the number of bacteria is reduced. The organisms are evidently not able to proliferate freely, and the wounds heal as though they were surgically clean.

While the Carrel-Dakin method makes use of a powerful disinfectant, which is at the same time a strong irritant, and which has but a transitory effect, so that it must be renewed at short intervals, making the treatment most troublesome indeed. [An objection which, as we have shown, Dakin attempts to remove by the introduction of dichloramin-T.—Ed.] This paste makes use of a much less irritant antiseptic, which is slowly and continuously liberated, so that the dressing does not have to be renewed for days or even weeks.

[Would not addition of iodoform or possibly of one of its succedanea of less disagreeable odor be of advantage in the Beck bismuth-paste treatment of tuberculous sinuses and cavities?—Ed.]

Acetic Acid as Specific Antiseptic in Bacillus Pyocyaneous Infection. Kenneth Taylor[1] reports a valuable study on the treatment of wounds infected with *Bacillus pyocyaneous*. As such infection was rarely found in wounds with a discharge of high acidity, while common in those of neutral or alkaline reaction, experiments were undertaken to determine which dressing would be more likely to be of benefit. It was found that inorganic acids are comparatively less active than organic acids; and that acetic acid was slightly more active than other organic acids tested. It and cresol give the best results *in vitro*. When these two were, however, compared in actual clinical use, it was found that cresol was ineffective, while acetic acid was consistently active. Inasmuch as the tables reporting the experiments are of considerable interest, they are reproduced here:

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(1) Jour. Amer. Med. Ass'n., Nov. 25, 1916.

TABLE 1. ACTIVITY OF VARIOUS SUBSTANCES ON THE GROWTH OF *B. PYOCYANEUS IN VITRO.*

Solution	Concentration Required to Inhibit Growth *in Vitro*
Acetic acid	0.090 per cent.
Sodium bicarbonate	Stimulates growth
Dakin's solution*	36.420 per cent.
Quinine hydrochloride	0.943 per cent.
Sodium chloride	8.000 per cent.
Benzoic acid	Saturated solution insufficient
Cresol	0.080 per cent.

*This lack of bactericidal power is also shown against some other organisms, notably the *B. aërogenes capsulatus* and *Staphylococcus aureus*, both in cultures in broth and in mediums containing albumin.

TABLE 2. INCIDENCE OF *B. PYOCYANEUS* IN WOUNDS DRESSED BY THE SAME SUBSTANCES.

Solution	On Entry %	After 1 Week %	After 2 Weeks %	After 3 Weeks %
Acetic acid	40	20	0	0
Sodium bicarbonate	20	25	83	66
Dakin's solution	36	43	14	67
Quinine hydrochloride	23	62	37	14
Sodium chloride, 0.8%	16	..	60	50
Sodium chloride, 5%	50	67	Dressing suspended	
Benzoic Acid	60	66	..	50
Cresol	67	80	50	67
Average all dressings except acetic	44	46	60	37

Taylor concludes that a moist dressing of 1 per cent. acetic acid in physiologic saline is the best dressing in treatment of *Bacillus pyocyaneus* infection.

The Specificity of Antiseptics. In a later article Taylor[2] publishes his studies of the effects of cresol, phenol, thymol, Dakin's solution, quinine hydrochloride, ammonium and sodium fluoride, salicylic acid and sodium chloride, upon streptococcus, staphylococcus, gas bacillus and *B. pyocyaneus.* He found such great variations in the susceptibility of the various organisms to the different antiseptics tested that he concludes that the concept of the "general antiseptic" must be abandoned. It is as futile as looking for a cure-all. He believes that

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(2) Lancet, Feb. 24, 1917.

further analytical studies of antiseptics will result in the elaboration of dressings specific for one or more groups of bacteria. When there is mixed infection, the successive application of these dressings would eliminate, one variety of organism at a time, until sterilization of a suppurating wound would be accomplished.

Quinine and Its Derivatives. The specificity of antiseptics is also well illustrated by the following article:

A specificity of quinine and of some of its derivatives against the pneumococcus was shown to exist by the studies of S. S. Cohen, J. A. Kolmer and G. D. Heist.[3] They tested the effect of various quinine salts and of ethylhydrocuprein (optochin) and methylhydrocuprein upon the various types of pneumococci, and quinine and ethylhydrocuprein on typhoid bacilli and staphylococcus. They also studied the effect of arsenobenzol, phenol, mercuric chloride, sodium salicylate upon cultures of pneumococci. While quinine and its salts showed a considerable degree of specific pneumococcidal activity, ethylhydrocuprein proved itself endowed with protective as well as curative powers; though other cinchona derivatives likewise possess a certain degree of protective value. The authors believe that ethylhydrocuprein holds to-day, in relation to pneumococcus infection, the same position that atoxyl held in the treatment of experimental trypanosomiasis.

[This means that it is not fit for use in human beings. It is too toxic. Nor is quinine sufficiently active, in spite of its comparatively specific relation to the pneumococcus brought out by these studies, to deserve a place as a specific remedy in human pneumococcus infection. All that Cohen and his associates can say for it, in consequence of these studies, is that until a more potent pneumococcide than even ethylhydrocuprein is found quinine might be used as one element in a therapeutic plan found clinically successful.—Ed.]

Ozone. In the treatment of wounds and of a case of ethmoidal antral suppuration, J. Jeffrey[4] found ozone of value; and in the treatment of sinuses and cavities, ozone has been found "wonderfully healing" by George

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(3) Jour. Inf. Dis., March, 1917.
(4) Brit. Med. Jour., Aug. 26, 1916.

Stoker.[5] Stoker believes that ozone acts in the following manner: 1. It is a strong stimulant and determines an increased flow of blood to the part. 2. It is a germicide. 3. It forms oxyhemoglobin. The special advantage of a gaseous agent in the treatment of cavities and sinuses is that it can reach every nook and cranny in a way that no liquid possibly can.

Applied by means of an Andreolis ozonizer, in which the oxygen delivered from a cylinder is passed over copper wire charged with electricity, the ozone is applied for a maximum time of 15 minutes daily, or until the surface becomes glazed. The usual changes are (1) increase of pus, (2) decrease and disappearance of pus, which (3) is replaced by clear serum, which (4) becomes reddish in color. Disclosed bone, foreign bodies and septic deposits must be dealt with surgically. When ozone treatment is employed, boiled water only should be used for dressing and cleansing the wound, as antiseptics are liable to destroy the ozone.

DYES.

Reports of remarkable properties of dyes appear persistently. Most notable about them is their specificity, or selective action for certain tissues or organisms. This is well illustrated by some of the following reports:

The selective excretion of dyes has been studied by R. L. Cecil and R. Weil[6] and, while it has nothing directly to do with antiseptic action, it points to the possibility of obtaining such results by properly chosen agents of selective affinity. The authors found that as much as 1 gm. of Congo red in 2 per cent., freshly prepared warm solution could be injected into human beings without apparent disturbance of the bodily equilibrium. The substance circulates in the blood for days, producing a discoloration of the serum and a diffuse reddish color of the skin, which lasts for several days, gradually fading away. Inflammatory and necrotic tissues have a marked tendency to take up the color; and its excretion from ulcerated surfaces, whether on the

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(5) Lancet, Oct. 21, 1916, and May 26, 1917.
(6) Jour. Amer. Med. Ass'n., Aug. 18, 1917.

skin or within the stomach, is a most interesting fact, especially as this excretion of dye "seemed at times to exercise a beneficial influence on the healing." It was also found that Congo red is excreted in large amounts in the bile.

In interesting contrast may be mentioned trypan red, which is well tolerated in amounts equal to those of Congo red. This substance does not seem to be excreted by the bile; and, while excreted promptly and profusely on the surface of external ulcerations, it has not been demonstrable in the stomach contents of patients with ulcer or cancer of the stomach. Of course, the possibility exists that the compound may have become decolorized by the chemical influences existing in the stomach.

The authors have investigated the excretion of various dyes by the liver, and were able to divide them into these classes: those that are and those that are not excreted, and those that are excreted occasionally. The latter class of dyes was excreted much more profusely by the liver of animals poisoned with phosphorus than by those with normal livers.

[These observations not only point in the direction of diagnostic possibilities, as important as those connected with the excretion of phenolsulphonephthalein by the kidney, but also of selective therapeutic potencies being hidden among the mysteries of the colors and allied compounds. The fact that salvarsan is a substance closely allied to dyes shows the reasonableness of this belief.—Ed.]

Flavine. "Acriflavine," "trypaflavine" or "flavine," as this compound has been called, seems at the present to stand at the head of dyes with desirable therapeutic properties. The name "Acriflavine" has been proposed for this substance (diamino-methylacridium chloride) by the Medical Research Committee of Great Britain(7) to avoid the German name "Trypaflavine," which is registered as a trade mark and which was applied to it because of its marked therapeutic effect in trypanosome infections, it having been originally prepared by Benda at Ehrlich's request. The name "Flavine" had been previously applied to a vegetable dye. Acriflavine has been found by Browning[8] and his associates to have the remarkable property of destroying bacteria without destroying tissue, impairing phagocytosis, or producing irritation. In marked contrast to most other antiseptics and disinfectants, the presence of serum seems to increase its potency. Against *Bacillus coli* it was found ten times more active than mercuric chloride. Against staphylococci it was found twenty times more powerful than mercuric chloride, and 800 times more effective than phenol. It seems to be non-toxic on intravenous injection. A strength of 1:100 should not be exceeded for this purpose, however, as more concentrated solutions have a tendency to produce agglutination of red blood corpuscles. A 1:1000 solution, which is equivalent as a disinfectant against staphylococci to an 80 per cent. solution of phenol, may be applied to wounds without pain or local irritation or injury to the skin. Solution of this strength in normal saline has been used successfully as an irrigating fluid in fresh wounds, as well as in the treatment of suppurations. When used for irrigation of fresh wounds, they usually heal by first intention; when used in suppurative wounds, a considerable diminution in the discharge of pus may be expected within twenty-four hours, and the suppuration to end within four or five days.

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(7) Jour. Amer. Med. Ass'n., London Letter, July 7, 1917.

That acriflavine is not as potent an antiseptic as claimed by Browning is the conclusion of A. Fleming,[9] who shows by most painstaking study that the erroneous conclusion of Browning and his co-workers is the result of incomplete observation. Fleming finds that the "lethal concentration" of acriflavine for microbes may be varied from 1 in 2,000 to 1 in 160,000 by merely having many or few bacteria for the agent to act upon, this slight change in technique producing a variation of 80 times. In calculating the toxic power of the substance toward leukocytes, Browning employed an exposure of 20 minutes, in which case it required a greater concentration than 1 in 500 to produce a marked effect. If, on the other hand, the agent is permitted to act for

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(8) Brit. Med. Jour., Jan. 20 and July 21, 1917.
(9) Lancet, Sept. 1, 1917.

24 hours, a concentration of 1 in 2,000,000 must be used before the effect becomes negative. Thus, by a mere alteration in the time of exposure, the figure may be altered by at least 4,000 times to the detriment of acriflavine. Thus Browning's "therapeutic coefficient," which he defines as the concentration which reduces phygocytosis 50 per cent., divided by the concentration just sufficient to kill bacteria in serum, is quite valueless, as such slight modifications in technique, as above indicated, produce enormous variations in the result. Thus, while Browning and his collaborators obtained a coefficient for acriflavine 800 times better than that given by carbolic acid, had they used many microbes and allowed the antiseptic to act on microbes and leukocytes alike for 24 hours, they would have found that carbolic acid gives a coefficient at least ten times better than acriflavine when serum is the medium employed, or 250 times better if the lethal concentration were estimated in pus.

Fleming finds that not only pus cells, but the body cells in general, have a great affinity for the dye; for, when injected intravenously in large doses, acriflavine immediately disappears from the blood, which acquires no bactericidal power, and is taken up by the tissues, which become yellow, but acquire no inhibitory power on the growth of bacteria. Intravenous injection is furthermore liable to be dangerous, because acriflavine tends to agglutinate blood corpuscles and to antagonize the clotting of blood.

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Brilliant Green. This substance, which has been found by Browning and his co-workers to be extremely active against cocci, but of considerably less value against *B. coli,* has been used by C. H. S. Webb[1] in strength of 1:1000 in normal saline solution as a lotion and as a moist dressing. It has been found non-irritating and harmless to such delicate tissues as the peritoneum, the meninges and the synovial membranes. While vascular tissue is not colored by it, less vascular tissues, such as skin, fascia, and sometimes bones, are stained green by it; so is necrotic tissue. It has been used according to the Carrel method, having the advantage

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(1) Brit. Med. Jour., June 30, 1917.

over the hypochlorite solution in being less irritant to the skin.

Methyl Violet and Methylene Blue. E. Baumann[2] calls attention to the great value of these aniline dyes in the prevention and treatment of suppuration, and deplores their very limited employment for this purpose at the present time, in spite of the many favorable reports to be found in the collection of about 150 references on this topic, which are appended to his article. These agents, he states, exceed all other known antiseptics in inhibition of germ growth and germicidal activity. They possess an extraordinarily high power of diffusion and do not coagulate protein. They are absolutely non-toxic in the amounts required therapeutically; and can be used in full concentration without producing irritation. Baumann prefers pyoktanin (coeruleum) to methylene blue; and recommends, most especially the use of 3 per cent., 5 per cent. and 10 per cent. pyoktanin gauze for drainage. He employs the 10 per cent. gauze for smaller wounds and the 3 per cent. and 5 per cent. gauze for larger cavities.

HEAT AND LIGHT.

The Local Use of Heat in Disinfection of an Infected Area in the Body. This is well illustrated by the work of William E. Shahan,[3] who uses a metal thermophore (Fig. 1, a and b) heated to the thermal death-point of pneumococcus (158° F.) for one-minute's application to the anesthetized cornea in the treatment of serpiginous ulcer of the cornea, due to pneumococcus infection.

The infective process was stopped in nearly all cases by one or two such heat applications. A similar process has been discussed under the heading of "Pasteurization of Corneal Ulcers" in Practical Medicine Series, 1917, Vol. III, p. 54, as recommended by Prince, who attempts to subject the ulcer to a temperature of 150° F. by holding a red-hot instrument about 3/16 inch from the ulcer until the instrument cools. He found the results better than those obtained by cautery. In-

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(2) Corr.-Bl. f. Schweiz. Aertze, Aug. 26, 1916.
(3) Jour. Amer. Med. Ass'n., June 30, 1917.

asmuch as a difference of only a few degrees Fahrenheit decides between success and failure, Dr. Shahan's instrument, the temperature of which can be accurately controlled, is a decided improvement.

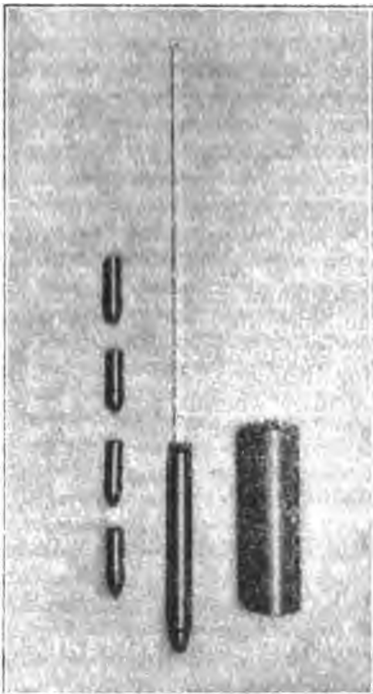

Fig. 1*a*. Thermophor parts: applicators, core with applicator and thermometer in position, and felt lined insulating case.

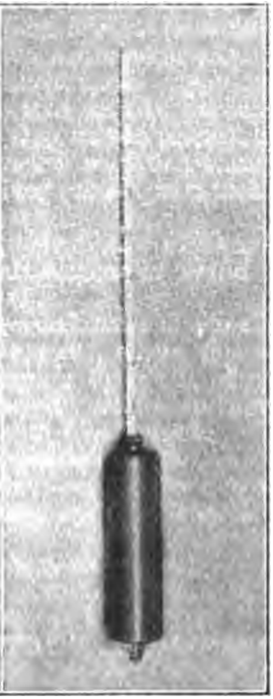

Fig. 1*b*. Assembled thermophor, as it appears when ready for use.

Shahan describes its use as follows: "A properly shaped applicator is selected and slipped into the end of the core. The thermometer is then slid through the lock-nut and core until its bulb is in the applicator as far as it will go. The thermometer is then fastened in place by a few turns of the lock-nut. Then, with the thermometer used as stem, the core is held over a flame, as that of a Bunsen burner, until the mercury in the thermometer reaches about 170° F. The core is then slipped into the insulating jacket, where it will be held by the friction of the felt. The mercury in the thermometer is then observed until it falls to 158° F. At this instant the tip of the applicator is placed in contact with the ulcer and held there for one minute. During this time the mercury will fall from 5 to 10° F., according to the size of the tip of the applicator. The eye is, of course, thoroughly anesthetized before the treatment is applied.

Unfortunately F. H. Verhoeff[4] has been unable to confirm Prince's results either clinically or experimentally. [Inasmuch as he did not use Shahan's technique, just detailed, and everything depends upon the use of the correct degree of heat, one may still hope that Shahan's method may not only prove useful for the disinfection of corneal ulcers, but also of other nonvascular areas, and that it may, properly modified, even be of value in vascular tissue, though here the application would probably have to be more intense and prolonged, as the blood current acts as a cooling stream. It is probable, too, that only superficial effects can be obtained by this means; and yet it may be doubted whether there is one of our chemical disinfectants that penetrates as well as heat.—Ed.]

Phototherapy in the Eye. F. H. Verhoeff[5] speaks of experiments on the use of phototherapy in the disinfection of the cornea. Working with Bell, he found, using a carbon arc and lens system delivering enough radiant heat at the focus to ignite a match almost instantly, that, while the control cornea was severely injured by the heat, an abscess nevertheless developed in the infected area. He also refers to experiments performed by him with ultra-violet light which prove that it is impossible to destroy bacteria within the cornea by means of ultra-violet rays without severely injuring the cornea. The relatively long ultra-violet rays, that were the only ones able to penetrate the cornea, were much less injurious to the bacteria than to the cornea.

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(4) Jour. Amer. Med. Ass'n., June 30, 1917.
(5) Ibid.

[In view of such negative results from light as a disinfectant in a tissue that gives it optimum opportunity for action, as Verhoeff applied the treatment immediately after infection and while the cornea was still transparent, one might suppose that whatever favorable results have been obtained from it in the treatment of infections[6] must have been due to the hyperemia and analgesia induced by it.—Ed.]

For discussion of zinc iontophoresis in ophthalmology, see page 209.

Ultra-Violet Light Not a Disinfectant of the Surface. F. König,[7] discussing the effect of ultra-violet light on erysipelas, states that he has been surprised at the rarity of erysipelas in the field hospitals, where so many wounds offer such an invitation to it, while in the hospitals at home there is much of it, with the old characteristic erratic course, severe where it might be expected to be mild, and mild in cases in which one would expect a severe course. In spite, however, of his earnest wish for a sure method of cutting short the course of the disease, König can not subscibe to the enthusiastic reports that the quartz lamp affords such a cure. He has used it in erysipelas since 1913, has seen many cases improve soon after its use, and believes it to be effective in some cases in cutting short the course of the disease. But he warns against making extravagant claims for it, for like every treatment for erysipelas, it fails completely in some cases, the inflammatory border of the erysipelatous area creeping over the well-irritated zone of light reaction as though no such zone existed, just as it does over other supposedly infallible zones, as the silver nitrate zone or the constrictor.

Two cases especially have strengthened his skepticism in respect to quartz lamp effect. In one case the light was employed to prevent infection in a plastic operation. In spite of this precaution, however, erysipelas occurred in the operation wound. In the other case, after treating a dirty wound for three weeks with the quartz lamp, a culture of streptococcus was obtained from the granulations. König did not expect, he says,

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(6) Practical Medicine Series, 1917, Vol. II, p. 83.
(7) Münch. med. Wochenschr., Nov. 28, 1916.

that the organisms in the skin should be killed, but he hardly thought that the light could fail to kill those right on the surface.

He advises that the light be tried in all cases, but that the patient and his friends receive no promises of a speedy and sure cure. Not only the public, but physicians as well, seem to be carried away with the idea that ultra-violet light is a cure-all. König mentions a case of carcinoma of the rectum treated for three months with the quartz lamp, until it was hopelessly inoperable.

Value of Ultra-Violet Light to Stimulate Healing of Ulcers. It is stated by F. S. Hawks[8] that every ulcerated surface that has been exposed to ultra-violet light during the previous eighteen months in his service at Aldershot has healed under the treatment. For epithelialization of indolent ulcers it has been very valuable, especially in lacerated head injuries, and for cleaning up infected wounds as well. He cites among other cases a dirty shrapnel wound of the elbow, from which fragments of bone had to be taken on three occasions, and an infected bullet wound of the wrist exposing the tendons. Another case of infection of the hand, resulting in contractures, and contracture of the knee consequent upon a compound fracture of the femur were resolved so that the joints regained their functionating ability. Indolent bubos and other venereal sores clean up quickly under the treatment, he reports. The light has also been useful in maintaining the health of skin grafts. Even gangrenous wounds clean up rapidly under it.

He has treated between thirty and forty skin cases daily with satisfactory results. He mentions lupus, sycosis, alopecia areata, acne vulgaris and rosacea, certain forms of rodent ulcer, nevus, eczema and psoriasis, and chilblains. In surgical tuberculosis its value is established, and in general forms of tuberculosis it has a beneficial effect. Anemias and debility due to other causes, chlorosis, amenorrhea and neurasthenia are also amenable. In angina pectoris and other conditions benefited by a temporary lowering of blood-pressure it is of benefit, relieves gouty, rheumatic and muscular pains, and has been recommended for excessive and painful

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(8) Practitioner, January, 1917.

menstruation and leukorrhea, vaginal catarrh and erosions of the cervix.

He explains its effects under four heads:

1. Bactericidal action.
2. Oxidation effects on tissues.
3. Increase of metabolism.
4. Immediate physiologic effects, probably reflexes from stimulation of peripheral nerves.

[After this burst of enthusiasm one wonders what is left for other forms of treatment. The inclusion of rodent ulcer in any form is a mistake likely to cast discredit upon a method of treatment very useful in fields where other treatment fails, as in lupus erythematosus and surgical tuberculosis especially.—Ed.]

Ultra-Violet Radiation from the Tungsten Arc. W. J. Turrell[9] of Oxford, England, has had an interesting experience in Finsen therapy. He found that the use of electrodes of tungsten gave better results than any others. The therapeutic value of the rays is due to the destructive action on bacteria and to the active hyperemia in the superficial tissues. The latter is most important, and a comparison of the erythema produced by exposures to various lights gives an idea of their comparative values. In this way the tungsten arc was shown to be the best, as well as by a comparison of the spectra, and by the effects of treatment. An attempt to use an incandescent filament of tungsten in a quartz globe proved that such a lamp, though of 2,000 candle power, has no value for actinic effects, being nearly destitute of the short wave length rays obtained from the volatilized metal of the electric arc. The spectrum of the rays from the tungsten arc exceeded in respect to these short rays the light of the quartz lamp also.

In the use of reflected light, the importance of a mirror of silicon is emphasized, for it returns 75 percent. of the ultra-violet rays, while nickel reflects only 40 per cent., copper 35 per cent. and silver only 6 per cent. Before treatment, crusts and necrotic material must be removed from the surface, to allow the light to reach the tissue. Preliminary zinc ionization is recommended. Ulcerating lupus is benefited, but the non-

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(9) Lancet, Nov. 4, 1916.

ulcerating form requires preliminary fulguration. Longstanding cases of eczema of the arms and face have done well. Lupus erythematosus has shown at least temporary improvement. Rodent ulcer is not adapted to the treatment, but yields much better to radiotherapy.

PROTOZOICIDES.

EMETINE.

Emetine. Emetine is becoming as well established as a specific remedy in intestinal amebiasis as is quinine in malaria. On the other hand, it has failed as a cure for pyorrhea, not because it does not act upon the amebas, but because pyorrhea is not caused by amebas. Besides emetine bismuth iodide, oil of chenopodium (q. v.) has been found of use in the eradication of cysts.

The pharmacology of emetine has been investigated by Pellini and Wallace,[1] who find that emetine produces three types of death, dependent upon the dose and manner of administration. On intravenous administration, prompt death occurs due to cardiac paralysis. On subcutaneous injection of 0.15 gm. per kg. in cats, death occurs in about four hours from respiratory failure with some effect upon the heart. Smaller doses produce death in from eighteen to thirty-six hours, the result being due principally to intestinal changes. They conclude that emetine is a powerful gastro-intestinal irritant, whether given by mouth or by subcutaneous injection; that it depresses and eventually may paralyze the heart; and that it causes a definite rearrangement of metabolism, characterized by an increase in nitrogen loss and acidosis. While in normal individuals, when moderate doses are given, these actions may not be of importance, in pathologic states of the circulation, the intestinal tract, or metabolism, they may be a definite source of danger.

That such danger actually exists in practice, is shown by the following report on:

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(1) Amer. Jour. of Med. Sci., September, 1916.

Emetine Diarrhea. A. R. Kilgore and J. H. Liu[2] find the diarrhea produced by emetine almost indistinguishable from that occurring in amebic dysentery. The danger is especially great in children, particularly if they receive unproportionately large doses. Contrary to the general opinion, children are not especially tolerant to the drug, and dosage for them should be apportioned with great care.

The Use of Emetine. This subject is discussed by John Eason,[1] who explains the variability of its toxicity as due to the fact that really pure emetine has not been prepared until comparatively a few months ago. Most of the emetine at present available is a mixture of emetine and cephaeline. It is even claimed by Hesse (quoted by Eason) that pure emetine has no emetic action; and that it is only contamination with some of the other alkaloids of ipecac that render it emetic. The chief danger is its contamination with the strongly toxic cephaeline. While, when emetine is used as an amebicide, the pure product only should be used, it is probable that the impure emetine or the older galenic preparations of ipecac are to be preferred when expectorant action is desired, which it is believed depends upon the production of nausea.

It is important to realize that emetine is a powerful irritant, sometimes producing extreme pain, swelling and erythema from hypodermic injection. Hence intramuscular injection should be employed in preference. The fact must be borne in mind that diarrhea, with blood, mucus, and much pain and tenesmus, may occur after the use of emetine hypodermically. Hence the diarrhea from emetine must not be confused with the amebic diarrhea, and the drug be continued or its dose increased to a dangerous degree.

Usually the dose for an adult should not exceed 0.06 gm. in one daily injection. After a course lasting from six to eight days an interval of one week should elapse, and then two-thirds of the previous number of injections in the same dosage should be administered. Children show relative tolerance for the drug. [Disputed by Kil-

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(2) Archiv. Int. Med., August, 1917.
(1) Edinburgh Med. Jour., January, 1917.

gore and Liu, whose report has been abstracted above. —ED.]

In using emetine in dysentery it appears that if there is to be benefit it will usually show by the third or fourth day.

[So specific is emetine believed to be that lack of success should cause one to reconsider the diagnosis.—ED.]

It seems efficient in direct proportion to the acuteness of the attack. Chronic dysentery or ameba carriers are, as a rule, uninfluenced directly by the hypodermic use of emetine. Low compares the action—or rather lack of action—of emetine on the amebic cysts to that of quinine on subtertian crescents; but believes that continued administration destroys the successive crops of the vegetative form in each case, and thus gradually decreases the number of cysts and crescents respectively, and eventually eliminates the infection.

[The double iodide of emetine and bismuth, given by mouth, seems, however, to produce best results in these cases, as the following reports show.—ED.]

Emetine Bismuth Iodide. According to Crowell,[2] this preparation, containing 29 per cent. of emetine, was devised by DuMez, in 1915, with the expectation that, inasmuch as it is practically insoluble in dilute acids, but soluble with comparative ease in dilute alkalies, it might pass the stomach unaltered, to undergo decomposition as it passed along the bowel with liberation of emetine and precipitation of bismuth sulphide. Dale (1916) tried it in ten cases with good results in eight.

Emetine bismuth iodide was found especially efficacious in removing cysts from the feces of chronic carriers, by Low and Dobell,[3] Dobell,[4] Low,[5] Imrie and Roche,[6] and LeBoeuf.[7] All of these observers report successes in the eradication of cysts from the feces of patients, in whom previous hypodermic administration of emetine hydrochloride had proved a failure. Not only

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(2) Jour. Amer. Med. Ass'n., July 7, 1917.
(3) Lancet, Aug. 19, 1916.
(4) Brit. Med. Jour., Nov. 4, 1916; an abstract of this article appears in Vol. VI, 1917, pp. 109-111.
(5) Lancet, March 31, 1917.
(6) Ibid., Jan. 6, 1917.
(7) Presse méd., July 9, 1917.

does it seem superior to emetine in this respect, but it has given as good results in cases of acute amebic dysentery and in amebic hepatitis as have subcutaneous injections of emetine hydrochloride; and it has the advantage that it is given by mouth. Its only disadvantage seems to be its tendency to produce nausea and even vomiting, though it does not have this tendency to the same extent as ipecac. It also tends to produce diarrhea, which, however, is considered advantageous rather than otherwise in the treatment of cyst carriers.

The dose generally employed is that recommended by Dale: 0.20 gm. in powder form packed in gelatine capsules taken nightly for twelve consecutive nights. Not less than 2.40 gm. in all should be given, as smaller quantities are generally followed by relapses. In cases in which a larger quantity seems necessary, the period may be extended to twenty instead of twelve nights.

To minimize the nausea, keratin-coated or salol-coated pills may be used. However, owing to the possibility that these may not dissolve, the powder in gelatine capsule is the most reliable. "To prevent sickness," Low says, "the precautions that were of use in the ipecacuanha days may be employed, the drug, however, in this instance being given on a full and not on an empty stomach. During the course the patient is better kept in bed, the diet being arranged in accordance with the acuteness or chronicity of the symptoms. For most cases a light diet, consisting of milk, white meat and white fish will be found most suitable. At 10 p. m. a small meal should be given, arrowroot, sago, tapioca, or corn-flour with a little milk, for example, and then immediately after this the capsule is taken. Five or ten minutes later some boiling water should be sipped, and this should be repeated if any sign of nausea or sickness occur throughout the night. For the first few nights, until one sees how the patient is to tolerate the drug, the pillows should be removed so as to keep the head low, no movement should be allowed, and if saliva accumulates in the mouth it must on no account be swallowed, but should be expectorated or removed by cotton swabs. If, after all these precautions the patient is still sick, a mustard leaf may be applied to the epigastrium on subsequent evenings, or 10 to 20 minims of tincture of opium may be given half an hour before the administration of the emetine. Such precautions will greatly mitigate, if not entirely prevent, sickness."

"The occurrence of this symptom is a very variable one; sometimes the first doses produce it and then a tolerance is established, while in other cases it appears toward the end of the course or irregularly throughout it. Three or four hours after taking the capsule is the usual time for the sickness to appear."

Dobell has shown that only 30 per cent. of cures are obtained when emetine hydrochloride is used subcutaneously, while he got 90 per cent. by using emetine bismuth iodide in the manner described above.

Of course, even after the amebas have disappeared from the stools, the patient may suffer from attacks of pain, bouts of diarrhea, and definite colitis, owing to the anatomic changes produced by the disease. Hence the patient must be strictly dieted for a long period afterward.

[It would be interesting to compare emetinated fuller's earth, and emetine phosphotungstate or silicotungstate with emetine bismuth iodide, all of these having similar properties so far as solubility is concerned.—Ed.]

OIL OF CHENOPODIUM.

Treatment of Carriers of Entamoeba Histolytica. Oil of chenopodium has been found worthy of further investigation by E. L. Walker and W. Emrich.(6) Of fourteen carriers treated by them, ten were apparently cured and four remained uncured, though they believe that all could have been cured if they had received further treatment. The treatment found most effective by them consisted of:

1. Magnesium sulphate, from ½ to 1 ounce at 6 a. m. This preliminary purgation is considered most important.

2. Oil of chenopodium, 16 "minims" at 8 a. m., 10 a. m. and 12 m. They believe it is best given in gelatin capsules.

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(6) Jour. Amer. Med. Ass'n., May 19, 1917.

3. Castor oil, 1 ounce containing chloroform, 50 "minims," at 2 p. m.

[The Editor wonders whether the author means drops or minims, for in case of oil of chenopodium as well as of chloroform it would make quite a difference. In the interest of safety, drops rather than minims, might be recommended.—Ed.]

METHYLENE BLUE.

Methylthionin Hydrochloride, Methylene Blue. It is a curious fact that as efficient as emetine is against amebas, as useless does it seem to be against some other protozoa, *e. g.,* the flagellates; hence the following communication is of interest: Merk's medicinal methylene blue is, according to Chase and Tasker,[8] the best remedy in the treatment of diarrheas due to flagellate protozoa, which are being encountered with increasing frequency in the temperate portions of the United States, and which may readily be diagnosticated by microscopic examination of a drop of feces on a warm slide. While other treatment, such as astringents, bismuth, opiates are well nigh useless, and rest in bed produces only temporary benefit, the oral and rectal administration of medicinal methylene blue gives excellent results, most especially in infection with cercomonas. It seems to have much less of a specific action on trichomonas and lamblia, though it is still the only drug that manifests any appreciable effect at all on either of these. Ipecac does not possess the same parasiticidal action against infection with flagellates that it exhibits against amebas. It is now the custom of Chase and Tasker to give 0.12 gm. (2 grains) every three hours by mouth and to administer at least once, and preferably twice, a day a high enema of 500 ml. of from 0.2 to 0.5 per cent. aqueous solution of the drug, which is to be retained for fifteen minutes. The patient should, of course, be informed that the blue color will appear in the urine.

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(8) Jour. Amer. Med. Ass'n., May 26, 1917; see also Practical Medicine Series, 1917, Vol. VI, pp. 235-239.

QUININE.

Administration of Quinine in Malaria. A. J. Ochsner[9] gives an admirable description of the technic of quinine administration. The following facts should be borne in mind, he says, in order to understand the details:

1. Quinine will kill the adult *Plasmodium malariae.*
2. Quinine will not kill the plasmodium in spore form.
3. Quinine will prevent spores from developing into adult forms.
4. Quinine, if given continuously, will consequently keep malaria spores in the body, which will later cause a recurrence.
5. Quinine must be absorbed in order to be effective.
6. Quinine must be kept constantly in the circulation, at least for forty-eight hours, in order to kill all plasmodia which belong to the one, two and three day type.
7. Quinine taken by mouth will not be entirely eliminated in three hours.
8. Quinine taken by mouth may all be eliminated in six hours.
9. It is consequently necessary to give quinine *night* and *day* at sufficiently short intervals to keep fresh quinine in the blood for at least forty-eight hours continuously.
10. The alimentary canal must be in a condition suitable for the absorption of quinine.
11. Hot water in large quantity should be given with each dose of quinine in order to insure solution and absorption.
12. The use of quinine should be completely interrupted for a sufficient interval after all adult plasmodia have been killed to permit the spores to develop sufficiently to be killed by quinine, but not long enough to permit new spores to form; that is, the interval should be less than seven days.

Rules for treatment:

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(9) Jour. Amer. Med. Ass'n., March 17, 1917.

1. Give an exclusive diet of hot soup for ten days' treatment.
2. On the evening of the first day give 2 ounces of castor oil in fruit juice or in beer foam.
3. At 6 a. m. of the second day begin giving a 2-grain capsule of quinine (preferably bisulphate) with cover taken off, with one-half pint of hot water, every two hours night and day for thirty doses, being absolutely sure not to miss a dose, in order to keep fresh quinine in the blood constantly. It is important to insist on waking the patient at night in order that the intervals shall not exceed two hours at any time.
4. The following six nights and five days give *absolutely no* quinine, but give a pill containing 1/50 grain of arsenious acid with one-half pint of hot water at 6, 9, 12, 3 and 6 o'clock.
5. Give castor oil as in Rule 2, on the evening of the fifth day.
6. At 6 a. m., following the sixth night, again begin to give 2 grains of quinine precisely as under Rule 3.
7. After that give general tonic and simple nourishing food.
8. Avoid reinfection by the use of screens and remaining away from locations where infected mosquitoes abound.

Hundreds of patients were cured by this plan, some of whom seemed incurable by means of quinine. Ochsner believes that the general application of this method should free any community of malaria, if a ten-day course of treatment were simultaneously instituted for all infected persons. The ordinary method, while satisfactory in acute malaria, is useless in the chronic form.

The errors usually committed are:

1. Neglecting to give the quinine with no greater interval than two hours, especially at night.
2. Not emptying the alimentary canal before beginning the course of quinine.
3. Giving quinine in some form during the interval of six nights and five days.
4. Failing to remove the cap of the capsule.
5. Not giving hot water with each dose of quinine.
6. Giving a lot of meat or other albuminous food.

[That this article was written by a surgeon is significant of the fact that surgeons pay a great deal of attention to exact technique. Were surgical technique as slipshod and bunglesome as ordinarily is the technique of medication, surgery would be much less popular and successful.—Ed.]

Intravenous Administration of Quinine. Jeanselme and Manaud[1] believe that, inasmuch as malaria is an infection of the blood, intravenous injection of the specific remedy would seem to be the best method of administration. They find, however, that intravenous injections of the basic hydrochloride of quinine [the only official hydrochloride of the old U. S. P.—Ed.] in concentrated solutions is so irritant to the vein as to be liable to produce painful indurations at the point of injection. This is perhaps due to a mechanical action, for the basic hydrochloride of quinine produces an abundant precipitate with blood serum in the test tube as well as in the vein. The dihydrochloride of quinine [Quininae dihydrochloridum, added to the new U. S. P., is soluble in less than its own weight of water.—Ed.] does not produce more than an opacity with serum in the test tube. The solutions are also more stable. Hence the dihydrochloride of quinine should be preferred for intravenous as well as for intramuscular injections. If the concentration of the solution is 1:100, the injection is well tolerated; the volume of liquid to be introduced being, at an average, 100 ml. This should be introduced very slowly and evenly, which is best done by means of gravity rather than by means of a syringe, with which such injections would be given too rapidly and in a jerky manner.

Idiosyncrasy to Quinine, Unusual in Degree. This case is reported by R. W. Stearns.[2] "The patient was well recovered from a previous cold and had no fever or other special symptoms except slight cough, weakness and loss of appetite. At 6 p. m. she took a small teaspoonful of a tonic, the dose representing less than one-half grain of quinine sulphate. About 10 p. m. she began to feel cold and nauseated, and the palms of her

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(1) Presse méd., May 31, 1917.
(2) Northwest Med., July, 1917.

hands and the soles of her feet itched. She became very pale and soon vomited her dinner. She vomited several additional times between 10 p. m. and 3 a. m. About 6 a. m., fever came on and she began to break out with a rash. Nausea continued for twenty-four hours and she was only able to keep from vomiting by lying perfectly still.

"About 4 p. m. the next day she had fever of 102° F., heavily coated tongue, a foul breath, and a rash closely resembling scarlatina completely covering her body. Symptoms gradually subsided with moderate desquamation and slight loss of hair. Patient was in bed five days and was not able to resume work for ten days. With this attack there was no marked disturbance of vision or hearing."

This patient was poisoned with quinine on five different occasions previously, and several times with pimento and paprika.

[This case is instructive for several reasons, among others, in bringing up the question whether the use of quinine as a "tonic" is well grounded or even justifiable. —ED.]

A Skin Reaction to Quinine. F. Boerner,[3] being hypersensitive to quinine, experimented upon himself and upon a colleague who was likewise hypersusceptible. After cleansing the forearm with alcohol and drying, two abrasions were made with a needle, about 3 inches apart. The scarifications were just deep enough to remove the superficial layers of the skin. To one of these abrasions powdered quinine sulphate was applied. The other was left untouched to show the amount of irritation produced by traumatism.

"In about five minutes the abrasion to which the quinine was applied began to itch slightly. This was followed by a slight edema along both sides of the pin mark which in ten minutes became very pronounced. At the end of fifteen minutes the reaction was at its height, and at this time was surrounded by a zone of erythema presenting a mottled appearance and extending over an area about 1 inch in diameter." It was found that the

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(3) Jour. Amer. Med. Ass'n., March 24, 1917.

best reactions could be obtained by a dilution of 1:10 of quinine bisulphate.

Six other persons, who could take quinine without inconvenience, did not present the slightest degree of reaction.

The hypersusceptibility could not be transferred to guinea-pigs by injections of serum from the hypersusceptible persons.

This skin reaction is offered as a test for determining the existence of idiosyncrasy to quinine.

MERCURY.

Oral Administration of Mercury. On the basis of a critical study of 120 cases of late syphilis, with particular reference to early treatment, U. J. Wile and J. A. Elliott[4] arrive at the conclusion that the *inefficiency of treatment by pills* is suggested by the fact that in those cases in which treatment was given the largest number had been treated in this fashion, without being protected against the late syphilitic sequelae. Intensive treatment as accepted by modern methods (salvarsanization and thorough mercurialization during the early months) is protective in the largest percentage of cases. In treated cases the occurrence of late sequelae, except for isolated and exceptional instances, must be regarded as an indictment against the method of treatment.

Inunction Treatment with Mercury. Wile and Elliott[5] arrive at the following conclusions regarding absorption of mercury in the inunction cure:

"1. Absorption occurs both by volatilization and by direct absorption through the skin.

"2. Non-volatile salts of mercury are absorbed through the skin, but their absorption and elimination are far slower than is the absorption of those salts having a high vapor pressure.

"3. The more rapid appearance of mercury in the urine in case of the volatile salts is probably due to the combined action of volatilization and inhalation through the lungs and absorption through the skin.

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(4) Jour. Amer. Med. Ass'n., Dec. 23, 1916.
(5) Ibid., April 7, 1917.

"4. In the order of rapidity of absorption, mercurial ointment ranks over calomel, although the latter is appreciably absorbed through volatilization.

"5. As the therapeutic effect of mercury is probably in proportion to the rapidity and degree of absorption, there can be no question that the volatile salts should not be superseded in the inunction cure by the non-volatile salts, even though the latter have the advantage of cleanliness.

"6. As calomel is obviously a cleaner preparation, and, further, as it is absorbed both by volatilization and directly through the skin, further study should be undertaken to determine whether its therapeutic effect may not justify its substitution for mercurial ointment."

Intramuscular Injection of Mercuric Salicylate. Certain administration forms of this salt, which is now official, are discussed by J. L. Lascoff.[6] Mercuric silicylate (Hydrargyri Salicylas) is a white, odorless and tasteless powder containing about 59 per cent. of mercury. It is nearly insoluble in water or alcohol; dissolved by solutions of the fixed alkalies or their carbonates; dissolved by warm solutions of the alkali halides with the formation of double salts. The U. S. P. gives its average dose at 0.004 gm.

Among the formulae given by Lascoff, the following, introduced by J. L. Wollheim[7] in a paper on "Painless Mercury Injections," seems to the editor the most desirable. Lascoff speaks of it as an elegant preparation from a pharmaceutic standpoint.

Quinine and urea hydrochloride.............	2.0 gm.
Distilled water..............................	2.0 ml.
Wool fat, anhydrous........................	12.0 gm.
Mercuric salicylate.........................	10.0 gm.
Olive oil or liquid petrolatum, to make......	100.0 ml.

The quinine and urea hydrochloride is dissolved in the distilled water. The mercuric salicylate is triturated with the anhydrous wool fat. Add the former solution to the triturate and then add gradually the oil or the liquid petrolatum.

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(6) Jour. Amer. Pharm. Ass'n., February, 1917.

(7) New York Med. Jour., July 27, 1912.

By the use of cacao butter, an ointment-like preparation is obtained, which has the advantage that it does not separate on standing, but the disadvantage that it must be warmed before transferring it to the syringe. When the suspension is made according to the formula given, a uniform and equal subdivision of doses is obtained. By far the most convenient and safest method of dispensing this preparation is in ampoules, which must be prepared in a thoroughly aseptic manner.

Comparison of Spirochetecidal Power of Drugs. The spirochetecidal power of seventy-six new compounds was compared with that of a number of well-known drugs by Seinai Akatsu.[8] Mercuric chloride kills the organisms in a dilution of 1:100,000. Phenol is spirochetecidal in a dilution of 1:2,500, lysol in 1:5,000, formalin in 1:750, salvarsan in 1:7,500 and neosalvarsan in 1:2,500. At least fourteen of the new compounds tested had the same spirochetecidal power *in vitro* possessed by neosalvarsan. Neither sodium nor potassium iodide displayed any marked spirochetecidal property (1:10 only), while iodine in the form of Lugol's solution was able to kill them at 1:75.

One of the most striking results of this study was the demonstration of the high degree of susceptibility of spirochetes to various hemolytic agents which had been previously noted by other observers. Thus spirochetes were killed in dilutions of 1:5,000 of sodium cholate, 1:2,500 each of sodium glycocholate or of taurocholate, 1:7,500 of saponin, 1:7,000 of sodium oleate. In this respect, bacteria in general differ greatly from the spirochetes in showing much more resistance against hemolytic agents.

[In view of the comparatively high efficiency of saponin, might there not be something in the ancient use of sarsaparilla and other saponin-containing drugs in the treatment of syphilis?—Ed.]

Drug Fastness of Spirochetes to Arsenic, Mercurial and Iodide Compounds was induced in cultures of *Treponema pallidum* and some other spirochetes by S. Akatsu and H. Noguchi.[9] By subjecting the spirochetes

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(8) Jour. Exp. Med., March, 1917.
(9) Ibid.

to increasing doses of salvarsan, neosalvarsan, bichloride of mercury and Lugol's solution, a gradual increase of resistance could be produced. The tolerance of *Treponema pallidum* to salvarsan and neosalvarsan was increased, within three or four months, to five and one-half times the original mark. Against the action of bichloride of mercury, the amount of increased tolerance was from thirty-five to seventy times the original. Lugol's solution has a weak inhibitory influence on the growth of the spirochetes; but the rate of increase of tolerance was slight, not exceeding three times the original amount. *The acquired drug-fastness in vitro gradually disappears when the spirochetes are cultivated again in the drug-free media for several generations.*

Since Ehrlich's attempt at *therapia sterilisans magna* has failed and repeated injections of salvarsan are used, these bring with it the danger of the production of arsenic-fast stains of spirochetes. The experiments quoted show the wisdom of the intermittent form of treatment, with gradually ascending doses of medicaments for each course, which has been so generally adopted by clinicians.

ARSENICALS.

A Comparative Study of Salvarsan and Neosalvarsan in the Treatment of Syphilis. This is reported by W. H. Trimble and J. J. Rothwell.[1] For this purpose, one division of the dermatologic department of Bellevue Hospital used salvarsan, the other neosalvarsan; the results being controlled by Wassermann tests. In all 110 patients were given 397 injections and had 337 Wassermann tests.

"The method of administration was the usual one and can be dismissed in a few words. Freshly distilled sterile water was always used. The salvarsan, after being neutralized with a 15 per cent. sodium hydroxide solution, was administered in 150 c.c. of water; the neosalvarsan was given in 50 c.c.

"The intravenous puncture method was always em-

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(1) Jour. Amer. Med. Ass'n., Dec. 30, 1916.

ployed, and the solution allowed to flow in by gravity. The dosage, ..., was for the patients taking salvarsan 0.3 gm. as the initial treatment and 0.6 gm. at the subsequent injections. For those taking neosalvarsan 0.45 gm. was given at the initial treatment and 0.9 gm. for the last three. All injections, with few exceptions, were given at intervals of one week.

"In every case mercurial treatment was instituted as soon as the last arsenical injection had been given. One group of patients was put on intramuscular injections of mercury salicylate, beginning with 0.06 gm. and going up as high as 0.15 gm. in some instances. The other group was treated by mouth administration, some getting tablets of mercuric chloride in increasing doses, while others (tertiary cases) received the mixed treatment of the clinic, increasing gradually both the mercury and the potassium iodide."

The authors' conclusions are:

"1. A course of four injections of either salvarsan or neosalvarsan is inadequate treatment.

"2. A series of injections of salvarsan, either old or new, not followed by mercurial treatment, produces extremely few negative serum reactions.

"3. From four to six salvarsan or neosalvarsan injections, even when followed by mercury, produce only a comparatively small percentage of negative serum results.

"4. According to this study neosalvarsan is superior to salvasan, being much easier of administration, less likely to cause severe reactions, and producing a greater percentage of negative results."

This result is at variance with that of Whitehouse and Clark (1913) and that of Nelson and Haines (1914), who found salvarsan more effective than neosalvarsan in producing negative serum reactions.

[Probably there is no great difference in the therapeutic value of the two preparations of salvarsan, provided they are used in equivalent dosage.—ED.]

Substitutes for Salvarsan. Owing to the limited supply of salvarsan and the exorbitant price charged for it, especially since the war began, a movement is on foot to abrogate the patent on salvarsan, which it is hoped will be successful.

Arsenobenzol, prepared by the Dermatological Research Laboratories of Philadelphia, is supplied at $1.50 a tube, and it is announced that a sufficient supply is available for any demand that may be made.[2] Its quality is reported to be very satisfactory.

Diarsenol and *Neodiarsenol* are Canadian preparations corresponding to salvarsan and neosalvarsan.

The following European substitutes are discussed by J. L. Bunch:[3]

Kharsivan and *Neo-kharsivan,* corresponding to salvarsan and neosalvarsan, respectively, are the most frequently used English substitutes.

Arsenobillon and *Novarsenobillon* are also English products.

The following French preparations are similar to, but differ from salvarsan:

Galyl, which contains arsenic and phosphorus. It is a yellow powder soluble in a solution of sodium carbonate, the requisite amount of which is supplied with each tube. May be given in concentrated solution (10 ml.) or in more dilute form (100 ml.). Initial dose 0.2 gm., to be repeated in one week if well borne, and to be followed by four doses of 0.25 gm. at weekly intervals.

Hectine is put up in bulbs of 1 ml. volume, each containing 0.10 gm. of hectine to be injected intramuscularly every other day for 10 doses.

Largol is an arsenobenzol compound combined with silver, bromine and antimony, containing 20.7 per cent. of arsenic. It is claimed to be more active and less poisonous than salvarsan. Initial dose 0.1 gm. for females or 0.15 gm. for males, may be given in 1 per cent. or in 1:1,000 solution. Five subsequent injections are given at three-day intervals, gradually increasing the dose until double the amount is given.

The Uselessness in Syphilis of Sodium Cacodylate and of Venarsen. Venarsen is a proprietary product, the main constituent of which is sodium cacodylate.

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(2) Jour. Amer. Med. Ass'n., July 21, 1917.
(3) Practitioner, March, 1917.

That both drugs are useless in syphilis is asserted by H. N. Cole[4] and by W. A. Wilson.[5] The latter says: "After using great quantities of venarsen I can see no more effect upon these cases than if so much water had been administered." Cole finds the cacodylate worse than useless in cases of syphilis with mucous patches. In no instance was the positive blood Wassermann changed to negative. At the utmost, sodium cacodylate has perhaps a slight action on the papular and nodular syphilids, but in no case is it to be compared with even mercury and potassium iodide alone. The effect is probably to be explained entirely from the tonic action of the arsenic on the system. In reply to the contention that might be raised that he did not use large enough doses, Cole, who employed 0.5 gm. every three days, replies that two cases out of ten showed red cells and albumin in the urine four and six hours, respectively, after injection. He is therefore willing to leave it to others more courageous to use larger doses.

[Sodium cacodylate is now official in the new U. S. P. It is described as a white deliquescent powder, soluble in about 0.5 part of water; average dose, 0.06 gm.—Ed.]

Toxicity of Salvarsan. J. F. Schamberg, J. A. Kolmer and G. W. Raiziss,[6] having conducted extensive experimental and clinical studies on the toxicity of Dioxydiamino-arsenobenzol dichlorhydrate (salvarsan), arrive at the following conclusions of practical importance:

"Failure to neutralize solutions of salvarsan with alkali leads to an increase in toxicity (50 to 60 per cent.); moderate excess of alkali does not increase toxicity, but may have other untoward effects.

"Sterile freshly distilled water appears to possess advantages over sterile stale or non-distilled water, although the difference was not pronounced.

"The toxicity of salvarsan in alkaline solution increases rapidly, due to oxidation. The drug should be used reasonably promptly after preparation.

"The immediate vasoparetic reactions are due to

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(4) Jour. Amer. Med. Ass'n., Dec. 30, 1916.
(5) Ibid., July 7, 1917.
(6) Jour. Cutan. Dis., May-June, 1917.

traces of an unidentified impurity in the drug, which has for convenience been termed substance *X*.

"Salvarsan, not being an absolutely pure chemical, may vary in its toxic and therapeutic effects. The commercial products should be tested by injections in rabbits. It should be tolerated by rabbits in doses of 60 mg. per kilo. of body weight."

"**Nitroid Crisis.**" This is a term introduced by Milian of Paris. The condition is described by B. B. Beeson[7] as consisting of "marked flushing of the face, especially the cheeks and ears. When severe this is accompanied by edema with swelling of the lips and tongue, and also by injection of the conjunctivae. Increased rapidity of the pulse, and marked dyspnea is added to the picture. Severe pain in the chest, especially over the precordium, may be present. Syncope ensues in severe cases. As its name would suggest, the "nitroid crisis" is very similar to what occurs when one inhales amyl nitrite. These crises usually occur during an injection, but sometimes do not appear until later, even the second or third day, when they are called secondary "nitroid crises." The manifestation seems to be due to a powerful vaso-dilator action of the arsenic, with consequent lowering of the blood-pressure. A premonitory symptom that the dose may not be perfectly tolerated is the appearance of a peculiar taste sensation while the injection is being given. Nausea and vomiting often accompany the "nitroid crises."

There are numerous *other symptoms of intolerance* to salvarsan or neosalvarsan. Among them may be mentioned: increased secretion of lachrymal and of salivary glands, serous diarrhea, due to a similar action of the glands of Lieberkühn. Marked fatigue for a few days after the injection, headache which usually disappears within twenty-four hours, transitory insomnia, tinnitus aurium, pruritus, pain about the articulations and along the vertebral column are some other manifestations of minor importance. Among the cutaneous manifestations following these injections, urticaria occurs most frequently, herpetiform eruptions, scarla-

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(7) Med. Rev. of Rev., December, 1916.

tiniform and morbiliform erythema are also commonly seen.

A fortunately rare but serious condition, called *serous apoplexy,* has also been described by Milian. It does not appear until three or four days after the injection, when the patient becomes agitated, epileptiform attacks appear, followed by coma and death, usually within from twenty-four to forty-eight hours after the onset. In autopsy on several such cases marked engorgement of the cerebrospinal canal and lateral ventricles was found.

Chilliness, fever, nausea and vomiting, temperature ranging from 100 to 104° F., lasting for a few hours after injection, should not be taken as evidence of intolerance, as similar phenomena may be produced by introduction of normal salt solution, bacterial proteids in the fluid injected, and it may possibly be due to the spirochetecidal action of the arsenic. If the symptoms are intense and prolonged they indicate arsenical intolerance.

Prophylaxis: "1. Use plain, freshly distilled water as the vehicle. It should be prepared the same day it is to be used.

"2. Employ a distillation apparatus which is entirely of glass, preferably Jena.

"3. The solution of salvarsan should be rendered alkaline, and then a slight excess, one or two drops of 15 per cent. sodium hydroxide is added.

"4. The initial dose of salvarsan should not exceed 0.30 gm., of neosalvarsan 0.45 gm. As a rule, one should not exceed 0.6 gm. of 606, or 0.9 gm. when giving neosalvarsan.

"5. From seven to ten days should constitute the usual interval between doses. In exceptional cases they can be given four to five days apart.

"6. The urine should be examined in all cases previous to injection.

"7. Be cautious in giving these drugs to alcoholics and nephritics; also to those who have cardiac lesions or acute inflammation of the upper air passages.

"8. Always give the injections on an empty stomach. Don't allow any solid food until the next day.

"9. Have your patient go home at once after the injection, and remain quiet for the rest of that day."

Treatment. Since the most important symptoms of intolerance, the "nitroid crises," headache, and diarrhea in certain cases, as well as serous apoplexy, seem due to a marked vascular dilatation, a vaso-constrictor like adrenalin chloride should be the best treatment. And indeed it is. It may even be used to prevent "nitroid crises" in patients who have developed one during a previous injection. Under such circumstances, give adrenalin ten minutes before the intravenous injection. Very soon the patient will become quite pale if the drug is exerting its effect. This "leuco-reaction," as it has been termed, should always be looked for as an index of the efficiency of the adrenalin. There may also be acceleration of the pulse even up to 100 to 120 beats a minute, a more or less generalized trembling and marked pain at the site of injection. These after-effects are of brief duration, excepting the pain which may last for a day or two. Flushing of the face during an injection of salvarsan or neosalvarsan should be an indication for stopping the injection at once, and giving one milligram of adrenalin chloride in 1:1,000 solution. It is best injected deeply into the muscles of the gluteal region. As much as four milligrams have been given in divided doses within one to two hours in cases of serous apoplexy, in which the intravenous route should be chosen for the administration of the remedy.

Salvarsan-Myelitis. While this not infrequently accompanies salvarsan encephalitis or cerebral edema, in rare cases it may appear alone, as occurred in a case reported by C. Socin,[8] who also speaks of a similar case reported by Chiari. Two days after the second intravenous injection of 0.5 gm. of salvarsan the patient became unconscious, developed clonic spasms and urticaria, retention of urine and fecal incontinence. Within a few days consciousness returned, but paralysis of the lower extremities and of bowel and bladder remained until death from broncho-pneumonia, fourteen months later, the patient having in the meantime developed extensive decubitus over the sacrum. On necropsy,

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(8) Corr.-Bl. f. Schweiz. Aerzte, 1916, Vol. 46, p. 1569.

marked degeneration of the pyramidal and cerebellar tracts was found, most especially in the lower thoracic region. A Jarisch-Herxheimer reaction could be totally eliminated.

The Administration of Salvarsan by Mouth. J. F. Schamberg, Kolmer and Raiziss[9] have demonstrated by experiments upon animals and by observation on the human that arsenobenzol (salvarsan) taken by mouth in solution or in capsules becomes absorbed into the blood; and that a distinct destructive influence can be exerted on trypanosomes in the blood of experimentally infected animals. About one-ninth or one-tenth of the dose required in solution by mouth produces an equivalent effect intravenously. In capsule form, however, the therapeutic effect is distinctly better than when administered in solution by mouth. In order to prevent oxidation of the arsenobenzol in the capsule, sodium hydrosulphite, a reducing substance, is incorporated with it. Bismuth subgallate has been added to lessen the likelihood of inducing diarrhea. The following formula has been employed for each capsule:

Arsenobenzol	0.03 gm.
Sodium hydrosulphite	0.015 gm.
Bismuth subgallate	0.12 gm.

Label: One after each meal, with water.

These capsules may be given three times a day for many weeks without producing disturbing symptoms except mild digestive distress, and this in only a relatively small proportion of cases. Thus administered, arsenobenzol (salvarsan) is capable of producing a curative influence on the lesions of syphilis. The effect, however, is much less vigorous than when the drug is administered intravenously.

The authors wish emphatically to disclaim any intention of advocating the use of salvarsan by mouth as a substitute for intravenous or intramuscular injection, which are far superior to oral ingestion. Syphilis should be treated with as massive doses of spirochetecides as can be given with complete safety to the patient. Oral administration is to be reserved for patients who for

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(9) Jour. Amer. Med. Ass'n., Dec. 23, 1916.

some reason can not take the drug by intravenous infusion or intramuscular injection. If it becomes necessary to administer for a time a drug by mouth in the treatment of syphilis, they would prefer salvarsan to mercury, first, because it is a more powerful spirochetecide, and secondly, because it has more tonic and roborant influence than mercury. The cost of the drug might, however, be deterrent. When used by mouth, it might be given for a period of from two to six weeks, after which its use should be interrupted for several weeks; its employment may be resumed later.

Intravenous Injection of Concentrated Solution of Neosalvarsan or Novarsenobenzol. This was first introduced by P. Ravaut (1915) and is strongly endorsed by M. Favre and Massia,[1] who have used this technique with satisfaction in over 3,000 injections. They employ only 2 ml. of water for solution. Novarsenobenzol dissolves most readily on slight agitation of the ampoule. Neosalvarsan, on the other hand, does not dissolve so readily. They therefore advise, in the latter case, to pour the water into the ampoule, while it is turned in such a way that its contents lie on its side wall, which are not permitted to return to the bottom of the ampoule, until after the water has been introduced. In this manner can be prevented the formation at the bottom of the ampoule of a sticky mass, which dissolves very slowly. The same dilution is used, no matter what the dose, even if it is larger than 0.90 gm. If sterile distilled water is not available, boiled and previously filtered water can be used safely. An all-glass syringe of 2.5 ml. capacity and a very fine needle are used. The advantages of this method are ease and simplicity of technique. The veins tolerate the concentrated solution perfectly, the authors not having observed the slightest manifestation of irritation of the walls of the veins. Nor is the irritation markedly greater, should some of the fluid be inadvertently deposited outside of the vein, than when more dilute solution is used. General reactions were absent in most of their cases; and those that did occur were very mild.

Tuberculosis a Contraindication to Salvarsan. That

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(1) Presse méd., April, 1916, p. 221.

tuberculosis is not a contraindication to salvarsan, but an indication to give it with great care in the treatment of double infection with tuberculosis and syphilis, is the result of N. B. Potter's[2] study of the subject. He arrives at the following conclusions:

"1. The prompt employment of salvarsan or neosalvarsan is indicated in latent, chronic and moderately active tuberculosis: (*a*) as soon as the nature of an added infection is diagnosed with reasonable probability to be syphilis; (*b*) whenever the history, signs or symptoms strongly suggest a previous luetic infection, particularly if such a patient is not improving upon the usually successful hygienic and climatic treatment for tuberculosis; but (*c*) active tuberculosis, acute tuberculosis, and diffuse miliary tuberculosis are usually definite contraindications to the use of these new arsenic preparations; although in both the first two-mentioned groups there will be found many luetic patients upon whom a small dose of salvarsan may well be tried and, unless followed by untoward effects, cautiously repeated in gradually increasing doses.

"2. When tuberculosis infects or becomes active in a patient with secondary, tertiary or even latent syphilis, the careful employment of one of these drugs is also indicated.

"3. The more active the tuberculosis, the smaller should be the initial dose; the slower its increase, the less frequent the interval, and the greater care and watchfulness required.

"4. Tuberculin-like fecal reactions may follow their administration, should be carefully watched for and, if present, the location, intensity and character will frequently guide in the selection of the next appropriate dose or interval."

ANTIMONY.

Tartar Emetic. In various protozoal diseases tartar emetic is of great efficacy is the conclusion of A. Castellani.[3] He says: "Its powerful action in trypano-

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(2) Amer. Jour. Med. Sci., December, 1916.
(3) Brit. Med. Jour., Oct. 21, 1916.

somiasis has been well proved, and it can be considered a specific in espundia, granuloma inguinale, kala-azar and oriental sore. It is efficacious in jaws, especially if combined with other drugs, and seems to have a beneficial action also in relapsing fever.'' He reports one case of oriental sore (superficial Leishmaniosis) cured by intramuscular and oral administration of the drug; and Neiva and Barbara[4] report three others cured by intravenous injection. Of four cases of kala-azar, Castellani succeeded in curing three, by intravenous, intramuscular and oral administration.

Oral administration of tartar emetic has the disadvantage of emetic action, which Castellani believes is minimized by combination with sodium bicarbonate. He uses at present the following mixture:

Tartar emetic	0.30
Sodium bicarbonate	2.00
Glycerin	30.00
Chloroform water	30.00
Water, to make	90.00

One to two teaspoonfuls in water three times a day. In adults the dose may be doubled.

Intramuscular injection is extremely convenient and especially useful in children, in whom the superficial veins are often small. Unfortunately it is very painful and liable to produce abscesses. The pain occurs after several hours, and is accompanied by infiltration, neither being generally very severe.

Tartar emetic	0.50
Phenol	0.60
Glycerin	12.00
Distilled water, to make	30.00

From 0.5 to 1.0 ml. injected intramuscularly in the gluteal region every other day.

The solution is prepared in bulk in a sterile bottle, and tested for sterility forty-eight hours after preparation; it may be put in small 1 ml. ampoules, which it is advisable to keep in a dark, cool place. The phenol lessens the pain and keeps the solution sterile. If pain

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(4) Prensa Med., April 10, 1917.

and inflammation should be severe fomentations will be found useful.

For intravenous injection a 1 per cent. solution in sterile physiologic salt solution is most generally used. Inasmuch as this solution can not be sterilized by heat, it is passed through a Chamberland F. or Berkefeld V filter. Of this solution, from 2 to 10 ml. are given daily for from five to ten days, then every other day or twice a week. The following solution has also been found satisfactory:

Tartar emetic	4.00
Solution of phenol, 2 per cent	100.00

Half to 2 ml. is diluted at the time of injection with sufficient sterile saline to bring it to 5 ml., and the whole injected into a vein.

In the treatment of yaws the following combination has been found best:

Tartar emetic	0.06
Sodium bicarbonate	1.00
Sodium salicylate	0.60
Potassium iodide	4.00
Glycerin	8.00
Water, to make	30.00

This dose is given diluted in three or four ounces of water three times daily; half doses are given to children from 8 to 14 years old, one-third or less to younger children. To Europeans generally half the dose is given.

In the treatment of relapsing fever, tartar emetic is far less efficient than salvarsan or neosalvarsan.

ALLEGED SPECIFICS.

SALICYLATES.

Salicylates in Experimental Arthritis. B. Fantus, W. E. Simmonds and J. J. Moore[1] studied the effect of salicylates in experimental arthritis of rabbits. The disease was produced by intravenous injection into young rabbits of a culture of hemolytic streptococcus isolated from the tonsil of a patient suffering from rheumatic polyarthritis. The following conclusions were arrived at:

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[1] Archiv. Int. Med., April, 1917.

Sodium salicylate, when used in a dose comparatively harmless to animal controls, is decidedly detrimental and liable to be fatal to animals infected with the hemolytic streptococcus. The addition of sodium bicarbonate does not lessen much the harmfulness of the salicylate to infected rabbits. Sodium bicarbonate given alone is not injurious to infected rabbits, neither does it produce a noticeable improvement. Acetylsalicylic acid, in equivalent dosage, appears to be much more toxic to normal rabbits than is sodium salicylate, and is harmful to infected rabbits as well. Salophen has either no influence or an unfavorable one on the course of the infection.

These results must not be construed to mean that salicylate is useless or harmful in rheumatic fever of human beings, for the clinical evidence seems too strong to doubt its value. They merely point to the assumption that the beneficial action of salicylates in rheumatic human beings is merely symptomatic, not really curative, a standpoint assumed by many clinicians. There is a possibility, too, that the various strains of hemolytic streptococci may differ in their susceptibility to salicylate, which would also be in harmony with clinical experience, for there are some cases in which salicylate seems to act like "magic," while there are others in which it is very disappointing.

[It is possible, however, that the negative results obtained are in harmony with clinical facts if the following articles abstracted below are correct.—Ed.]

Salicylates Useless in Acute Articular Rheumatism. This is believed by L. M. Frenkel,[2] who is convinced that acute febrile polyarthritis has a remittent or intermittent character. Parallel cases in his clinic passed through parallel phases of exacerbation and remission, whether salicylate had been given or not. When a natural remission comes on after taking the drug, the relief

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(2) Prakticheskiy Vrach, 1916, Vol. XV. No. 38-39, p. 278.

of the symptoms is ascribed to the drug, when in fact the drug is not at all responsible for it.

Kidney Changes Produced by Salicylates. These changes have been studied by R. W. Scott and P. J. Hanzlik,[3] by P. J. Hanzlik and Karsner,[4] and by P. J. Hanzlik, R. W. Scott and Thoburn,[5] on animals as well as on human beings, normal, rheumatic, non-rheumatic, febrile and afebrile. They found that, in animals, the administration of salicylate in doses corresponding to full therapeutic doses for human beings per kilogram of body weight, causes the appearance of albumin, leukocytes and of casts, and sometimes of red blood corpuscles in the urine, due to an acute tubular nephritis. They administered to human beings sodium salicylate in 2 gm. doses every hour, in form of solution, until signs of intolerance; that is, ringing in the ears, deafness, dizziness and nausea appeared, when the administration was stopped. Salicylate caused prompt albuminuria, which reached its maximum about ten hours after the administration, approximately at "toxicity," and disappeared on completion of the salicyl excretion (third or fourth day). There is a concomitant diminution in renal functional efficiency, as evidenced by diminished water excretion and elimination of phenolsulphonephthalein and accumulation of urea nitrogen in the blood. The administration of alkali with the salicylate does not produce a demonstrable influence upon these changes. The albuminuria is not of febrile origin, because it is promptly produced in the afebrile organism; the sequence of event, that is, appearance of albumin, maximum excretion, its course and abatement, taking place precisely the same way.

[The importance of this study can hardly be overestimated, in view of the fact that, in the past, the appearance of albuminuria during salicylate administration generally caused no uneasiness, as it was assumed to be of febrile origin. If the action of salicylate is merely symptomatic, then it probably should not be pushed in the treatment of acute articular rheumatism

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(3) Jour. Amer. Med. Ass'n., Dec. 16, 1917.
(4) Archiv. Int. Med., December, 1917.
(5) Ibid.

as heroically as it has been in the past; and the appearance of albuminuria should be considered one of the signs indicating the diminution of dose or discontinuance of administration.—Ed.]

Salicylate Does Not Accumulate Especially in the Fluid of Rheumatic Joints. This is the verdict of Scott, Thoburn and Hanzlik,[6] who found that, in individuals suffering from rheumatic fever, who received full therapeutic doses of salicylate, the average concentration of salicylate in the joint fluid was 0.018 per cent. against 0.02 per cent. in the blood. They were unable to demonstrate free salicylic acid in the joint fluid of rheumatic fever patients.

[This throws doubt upon the theory that the efficiency of salicylates in rheumatism is due to liberation of salicylic acid in the inflamed joints by the high CO_2 tension present in the inflamed tissue.—Ed.]

Administration of Salicylates: *Inunction.* Yanovsky[7] recommends Bourget's salve as effective, non-irritant, though containing 25 per cent. of salicylic acid, inexpensive, colorless, and not prone to rancidity:

Salicylic acid	12.5 parts
Turpentine	8.0 parts
Lard	42.0 parts

[The use of methyl salicylate in a formula similar to the above, instead of the turpentine, would seem an improvement; for it is so much more pleasant in flavor than turpentine, probably quite as efficient as a rubefacient—which is evidently the reason for the presence of the turpentine in the formula, the hyperemia produced by it favoring the absorption of the salicylic acid—and finally the methyl salicylate would yield additional salicylate to absorption. It may be noted incidentally that the United States Pharmacopoeia no longer recognizes oil of gaultheria or oil of sweet birch, except as synonyms for methyl salicylate.—Ed.]

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(6) Jour. Pharm. and Exp. Therap., January, 1917.
(7) Russkiy Vrach, 1916, Vol. XV, p. 1011.

Intravenous Administration of Salicylates. A. A. da Matta[8] recommends the injection of from 5 to 10 per cent. solution of sodium salicylate, made with distilled and sterilized water, as most efficient in rheumatism. He gives the injections in a series, starting with a 5-gm. dose, and increasing to 10, 15 and 20 gm., repeating the injection every second or third day, or at longer intervals. He believes that following this with 20 or 30 ml. of physiologic salt solution, and then with from 50 to 100 ml. of 10 per cent. solution of sodium iodide is particularly to be recommended.

"Natural" and Synthetic Salicylate. These have been compared by P. Bartholow and A. McNeil,[9] who feel that the studies of Waddell, Hewlett, Eggleston and Hanzlik—which showed that their effects were indistinguishable—manifest a strong bias. Bartholow and McNeil arrive at the conclusion that the effects on animals of natural and artificial salicylate are virtually the same. But they believe that there is a difference between the effects of natural and synthetic salicylate in men, which is in favor of the natural product; that the natural product produces less gastric disturbance, slighter cerebral effects, and that it has less cumulative tendency.

[Unfortunately, Bartholow and McNeil have not seen fit to give us details of their clinical experimentation and observations, which the authors who arrived at the opposite conclusion were good enough to do. In view of this fact, the Editor is inclined to take the position that the difference between the two still remains to be proved.—ED.]

Acetylsalicylic acid rather than aspirin should be prescribed in the interest of economy. Even though the patent on acetylsalicylic acid has expired (February, 1917), the Bayer Company, which by reason of this patent has enjoyed exorbitant profits on this product —selling in the United States at 43 cents an ounce the same substance which in various countries in Europe was sold under its scientific name at 4 cents an ounce— is attempting to prolong its monopoly indefinitely by

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(8) Brazil-Medico, Oct. 14, 1916.
(9) Amer. Jour. Med. Sci., May, 1917.

means of their copyright trade-mark "aspirin." Inasmuch as acetylsalicylic acid is a definite chemical, there is no more probability of its being adulterated than there is of sophistication of quinine. The Council of Pharmacy and Chemistry of the American Medical Association has refused "aspirin" further recognition, and merely describes "acetylsalicylic acid" in New and Non-Official Remedies, 1917.[1]

CHAULMOOGRA OIL.

Chaulmoogra Oil in Leprosy. *The hypodemic use,* as recommended by Heiser (1914), is endorsed by N. Bercovitz.[2] Heiser's formula is as follows:

Resorcin	4 gm.
Chaulmoogra oil	60 ml.
Camphorated olive oil	60 ml.

This mixture was sterilized and injected under the skin of the arms or legs, using at first 1 ml. weekly.

After three weeks the dose was gradually raised until 3 ml. were injected each week. Such injections were continued for nine months. Slight reactions, consisting of headaches, malaise, and a suggestion of nausea, are liable to occur a few hours after the injection. There was no local reaction at the site of the injections.

The tubercular form of leprosy responded to this treatment earlier than the anesthetic form. The latter, however, also responded; and the anesthetic areas became hypersensitive with improvement; and some patients reported return of tactile sensation. Under this treatment large ulcers have healed with the formation of clean, white scar tissues. Sections from two cases showing marked clinical improvement have shown degeneration of the epithelioid cells and development of fibrosis, the bacilli being present within the nodule. The process is evidently similar to that which takes place in the healing of tuberculosis. In a case in which

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(1) For reasons for this deletion, consult Jour. Amer. Med. Ass'n., January 20, 1917, pp. 201, 213.

(2) Jour. Amer. Med. Ass'n., June 30, 1917.

very slight improvement resulted these changes were not observed.

[Inasmuch as the reason for the value of chaulmoogra oil in leprosy is not known, and it is probably not specifically disinfectant or antiseptic, the observation of the tendency to the production of fibrosis recorded by the author seems of interest.—ED.]

THE CHEMOTHERAPY OF TUBERCULOSIS.

Since tuberculin in all its forms has failed as a specific cure for tuberculosis, investigators have undertaken a more or less systematic study of the chemotherapy of tuberculosis, well illustrating the truth of the saying that "hope springs eternally in the human breast."

Present Status of Tuberculosis Chemotherapy. This subject is reviewed by Lydia M. DeWitt in "Studies from the Otho S. A. Sprague Memorial Institute."(3) She points out that, owing to the irregular clinical course of the disease, it is most deceptive in its therapy. Judgment based upon clinical evidence is unreliable unless it extends over long periods and includes a large number of patients. The guinea-pig, however, is so extremely susceptible that anything that will cure the disease in the guinea-pig will be almost certain to do so in man, who is much less susceptible.

So far only a limited number of chemical compounds has been tested, among these iodine, arsenic, sodium sulphocyanate, certain dyes, especially methylene blue, gold, silver, mercury and copper. The experimental evidence regarding the value of most of these is, on the whole, negative, the most encouraging results having been obtained with gold, mercury and certain dye compounds. It must be concluded, therefore, that we are still just at the beginning of the experimental study on this subject.

Some derivatives of *Methylene Blue* have been studied by Lydia M. DeWitt, and a preliminary report of her work was given at the Twelfth Annual Meeting of the National Association for the Study and Prevention of

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(3) Vol. 4, 1916.

Tuberculosis.[4] The author obtained rather encouraging results with iod methylene blue and with three mercuric chloride salts of methylene blue.

Arsenic Compounds. These have been studied for tuberculocidal action and their distribution in the tuberculous organism by A. Arkin and H. J. Corper.[5] They found that sodium arsenite, sodium cacodylate, atoxyl, arsacetin and neosalvarsan can not be said to have any specific action on human tubercle bacilli. No evidence of their accumulation in tuberculous tissue has been obtained. If they are of value in the treatment of tuberculosis they are so only because of their favorable influence upon metabolism.

Copper Salts. These salts have been found by De Witt and Sherman[6] to have but slight killing effect upon the tubercle bacillus; but a marked inhibitary action, 1:100,000 preventing their growth in sterile distilled water. If this concentration could be attained and maintained in the human body, we might be able to prevent the further development of the disease and eventually kill the organisms. However, the soluble copper salts so far used by them are changed to insoluble form chiefly at the point of injection, giving rise to ulceration and necrosis.

Cyanocuprol. This is a double salt of copper and potassium cyanide prepared by Koga,[7] and which has been subjected to further clinical study by Otani,[8] who has obtained favorable results in 60 per cent. of seventy-one cases of one series and 72.4 per cent. of forty-seven cases of a second series in which somewhat smaller dosage was used. This, in spite of the fact that there were more severe cases in the second than in the first period.

This preparation, a colorless fluid, unstable on exposure to the air, hence only to be used from freshly-opened ampules, is so irritant that it can only be used by intravenous injection. As the choice of the proper dose is of the greatest possible importance, and as better results were obtained with the smaller than the larger

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(4) Ibid.

(5) Jour. Infec. Dis., April, 1916.

(6) Ibid.

(7) Koga's work as well as the first paper of Otani has been reported in Practical Medicine Series, 1917, Vol. I, p. 70.

(8) New York Med. Jour., March 24, 1917.

doses previously used and reported upon, the following dose table is here inserted, as it should supersede that given in the previous report.[9]

STANDARD SIZES OF DOSE.

Affected organs.	General condition.	Temperature.	Severe symptoms.	Clinical course.	Dose c.c.
Lungs.	Good.	Normal.	None.	Quiescent.	7.0
	Good.	Normal.	Present.	Quiescent.	5.0
1st stage	Fair.	Below 38° C.	None.	Moderate.	6.0
	Fair.	Above 38° C.	None.	Active.	4.0
Lungs.	Good.	Normal.	None.	Quiescent.	6.0
	Good.	Normal.	Present.	Quiescent.	4.0
2nd stage.	Fair.	Below 38° C.	None.	Moderate.	5.0
	Fair.	Above 38° C.	None.	Active.	4.0
Lungs.	Fair.	Above 38° C.	None.	Very active.	3.0
	Good.	Normal.	None.	Quiescent.	5.0
3rd stage.	Good.	Normal.	Present.	Quiescent.	3.0
	Fair.	Below 38° C.	None.	Moderate.	3.0
	Fair.	Above 38° C.	None.	Active.	2.5
Larynx.	Good.	Normal.	None.	Quiescent.	5.0
Intestines.	Good.	Normal.	Present.	Quiescent.	3.0
Pleura.	Fair.	Below 38° C.	None.	Moderate.	3.0
Peritoneum.	Fair.	Above 38° C.	None.	Active.	2.0

After the injection, the patient should remain in bed for one or two weeks, owing to the possibility of febrile and lesional reactions; and, for the same reason, these injections should never be given with a shorter interval than two weeks.

If a certain dose produces a marked reaction, it was too large and should be reduced next time. A suitable dose produces no reaction, or merely a very slight and transient one, and evident improvement should occur within two weeks. Such dose should be repeated; and may even be reduced on subsequent administration. If no improvement occurs, the same dose or a smaller dose should be continued, as susceptibility increases; and, therefore, even on continuance of the same dose, the right dose will ultimately be reached.

[It is believed that this drug acts primarily upon the tissues and only indirectly upon the tubercle bacilli. Hence it seems to be in line with some of the older, at present apparently abandoned, attempts at specific

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(9) Practical Medicine Series, 1917, Vol. I, p. 76.

tuberculosis therapy with potassium cantharidate, or with sodium cinnamate (hetol).—Ed.]

Taurin. This drug has been studied in the treatment of experimental tuberculosis by M. Takeoka.[1] He was led to use this most characteristic animo-acid of the bile for this purpose by the relative infrequency of tuberculosis of the liver (Zehden), and the distinct tendency of liver tubercles to heal (Sabourin), by Brissaud and Toupet's inability to find tubercle bacilli in the liver of patients dead with the disease, by Letienne's failure to find them in bile, and the finding of Beck that taurin in synthetic culture medium inhibited the growth of tubercle bacilli.

Infected guinea-pigs, three, seven and fourteen days after infection, were given from twenty-eight to forty-three doses of 0.5 gm. each of taurin dissolved in 7.5 c.c. of distilled water by hypodermic injection every day.

The results of this treatment are summarized by the author as follows:

"In nearly every instance the controls all died before any of the treated animals; and, whereas the controls lost weight almost uniformly, the treated animals gained. The majority of the treated animals were killed for observation many days after the controls had all died. The contrast in the extent of visible tuberculosis between controls and treated animals was marked. Whereas the process was advanced in the controls, it was arrested and in some instances apparently cured in the treated animals. The success of the treatment varied naturally in accordance with the variations in infecting dose, the route of inoculation, and the time of beginning treatment, as specified in the protocols. In all experiments and in nearly every instance the results were distinct, and in many instances startling. The progress of the disease was arrested and apparently cured when treatment was begun as late as three weeks after infection."

"Rabbits were infected with intraperitoneal or intravenous injections of bovine tubercle bacilli and treatment was carried out by intravenous injections of taurin. The results were similar, but even more marked than

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(1) Jour. Infec. Dis., April, 1916.

in guinea-pigs. Otherwise fatal infections, which in evolution were slower than in guinea-pigs, were not only arrested, but evidence of them often definitely disappeared. Histologic examinations of organs in these experiments showed in treated animals arrested tubercles, absence of caseation, disappearance of tubercle bacilli in the lesion, and evidence of repair by connective-tissue ingrowth, as contrasted with advancing lesions, with caseation and numerous bacilli in the controls. A number of treated animals showed minimal evidences of tuberculosis, and in no inconsiderable number the tissues were essentially normal microscopically. In such successful cases treatment was begun as late as two weeks after inoculation."

Observations Bearing on the Possibility of Developing an Experimental Chemotherapy of Tuberculosis. Paul A. Lewis[2] believes in this possibility because he knows: that certain substances have a special tendency to localize in tuberculosis tissue, even its caseous center, for instance, trypan-red and Niagara blue, which does away with the claim made that the caseating tubercle is extravascular and therefore not reached by chemicals introduced by way of the blood; and that certain relatively non-toxic bodies are much more inhibitive to the growth of the tubercle organism than others, such as the typhoid bacillus; for example, to acridin orange the susceptibility of the tubercle bacillus is 100 times that of the typhoid organism, to heliotrope (a dye related to safranin) it is four hundred times greater.

[While all this is very interesting, and while it is encouraging that so much progress has been made in this most difficult and important subject, it is necessary for the general practitioner to realize that we do not as yet have a specific chemical remedy against the tubercle bacilli. He should also remember that the tuberculous patient should not be experimented with in the hope of finding such a remedy until after exhaustive tests upon the guinea-pig have justified such use in the human.—Ed.]

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(2) Bull. Johns Hopkins Hosp., March, 1917.

IODINE AND IODIDES.

Tincture of Iodine. Given in progressively increasing dosage, this is considered by J. Ritter[3] the most logical and appropriate remedy for treatment of tuberculosis in all its various forms. He recommends the following method for the administration of tincture of iodine, U. S. P.

"Beginning with a single drop in half a glass of milk with the first meal, two drops at the second, three at the third and so on until a dosage of 20 or 30 drops has been reached, then this amount may be given three times a day and this maintained for some time. If it now be desired to increase this dose, then the gradually increasing drop method should be resumed until 50, 60 or even 100 or more drops are given. When the highest dose has been reached, this should then be given three times a day; should, however, an individual's indiosyncrasy show an iodine intolerance, then the dosage may be lessened or for a time entirely inhibited."

The author asserts that "by this method the administration of iodine in the form of tincture in from 60 to 100 drops three times a day may be maintained for months and months without the least fear of either a local or a systematic disturbance."

[While somewhat sceptic regarding its value in tuberculosis, the method of administration seems interesting and possibly of practical value. In this connection the following study may be of importance.—ED.]

The Fate of Iodine, Iodides and Iodates in the Body. T. Sollmann[4] has attempted to determine (1) whether the administration of elementary iodine can result in the appearance of iodide and iodate in the blood or tissues; and (2) whether elementary iodine can be liberated from iodide and iodate, combined or separately, with the reaction (hydrogen-ion concentration) that is known to exist in the body. Both questions can be answered in the negative.

Serum, protein solutions and urine interfere with the tests for free iodine, unless this is in large excess.

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(3) Ill. Med. Jour., February, 1917.
(4) Jour. Pharm. and Exp. Therap., February, 1917.

This action is due to the binding of the iodine by the aromatic groups of protein, especially tyrosin; and by the phenols and some other constituents of urine.

From his tests Sollmann concludes that:

1. The blood, after the administration of free iodine, does not liberate iodine on acidulation, because the iodine is bound through the protein, and not through the alkali.
2. Free iodine can not be liberated in the body, since all the conceivable reactions for the liberation of iodine from its compounds require much higher hydrogen-ion concentrations than exists anywhere in the body.

ANTHELMINTICS.

THYMOL.

Use of Thymol in Trichinosis. B. A. Booth, W. N. Goehring and M. Kahn[1] recommend the use of thymol in trichinosis during the two stages of the disease.

During the first stage, when the parasites are still within the lumen of the intestine, they would use thymol as suggested by Ashford, King and Gutierrez of Porto Rico. "A saline purge is administered to the patient the evening before the thymol is given. The next morning, no breakfast being allowed, the patient (if an adult) is given 2 gm. of powdered thymol in capsules, and another 2 gm. two hours later, after which another dose of salts is administered. The dose of thymol varies, according to the age and strength of the patient."

The doses in one day advised by the Porto Rican authors are:

Under 5 years	0.5 gm.
Between 5 and 10 years	1.0 gm.
Between 10 and 15 years	2.0 gm.
Between 15 and 20 years	3.0 gm.
Between 20 and 60 years	4.0 gm.
Above 60 years	2.0 to 3.0 gm.

During the second stage, when the parasites have invaded the body, the authors suggest the parenteral

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(1) Jour. Amer. Med. Ass'n., Dec. 30, 1916.

administration of thymol one grain (I suppose Gr. 1 is meant) to 1 ml. of sterile olive oil, injecting 2 to 3 ml. of this solution subcutaneously daily for seven days. In the case reported, this treatment was followed by a rapid improvement and an increase of the eosinophilia from 20 per cent. to 55 per cent.

[One can not help being skeptic about the real value of this treatment in the second stage of this disease. Thymol would have to have an extraordinary specific affinity for trichinae to be able to affect them, when 3 grains of it are distributed throughout the system.

As to the use of thymol in the first stage of trichinosis, one naturally wonders whether oil of chenopodium, in view of its superior vermicidal qualities, might not be of greater value.—Ed.]

Thymol in Uncinariasis. B. E. Washburn[2] reports the results of a research on thousands of sufferers from hookworm disease, which showed that thymol is much more effective when finely powdered and when mixed with at least an equal amount of lactose; or, better still, with an equal quantity of sodium bicarbonate, which not only seemed to improve the efficiency, but also to antagonize the burning sensation and slight gastric pain that is likely to be experienced by a considerable proportion of those taking thymol. The thymol-soda mixture cured 51 per cent. of patients in two treatments, against 43 per cent. of thymol lactose, and 12.6 per cent. of pure thymol. At the end of four treatments 83 per cent. were cured by the thymol-soda mixture against 76 per cent. of the thymol lactose combination. Only a few individuals required seven treatments until the stools were free from the evidences of hookworms.

Oil of Chenopodium and Chloroform.

Oil of Chenopodium in Uncinariasis. Up to the beginning of the European war thymol was the most popular remedy against hookworm. When, in consequence of the war, it became difficult to obtain thymol, physicians commenced to use oil of chenopodium, which is cheap. It now appears, from current reports, that it is not only cheaper, but also more effective than thymol.

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[2] Ibid., April 21, 1917.

W. C. Billings and G. P. Hickey[3] give the following comparison of the efficiency of the two agents:

NUMBER OF TREATMENTS REQUIRED WITH THYMOL AND OIL OF CHENOPODIUM.

Thymol (300 cases)		Chenopodium (300 cases)	
Number	Per Cent.	Number	Per Cent.
1	74	1	87
2	15 plus	2	13
3	6 plus	None over two treatments.	
4	2 plus		
5	0.5		
6	0.7		

This agrees with the observations of W. Schüffner and H. Verwoort,[4] who reported that oil of chenopodium showed an efficiency of 91 as against 83 for thymol, when the number of worms expelled as the result of alternate treatments in the same patient is counted.

Billings and Hickey also consider the oil of chenopodium safer and less troublesome because no special dietetic precautions need be exercised in connection with its use.

They use the following routine method for adults:

Preparatory treatment: At 7 a. m. magnesium sulphate, saturated solution, 60 ml. is given. At 7 p. m. sodium sulphate, saturated solution, 90 ml. The next morning chenopodium is commenced, proceeding as follows:

7 a. m., oil of chenopodium, 15 drops.
9 a. m., oil of chenopodium, 15 drops.
11 a. m., oil of chenopodium, 15 drops.
1 p. m., castor oil, 18 ml.; chloroform, 2 ml.
1:30 p. m., plain castor oil, 30 ml.
2 p. m., a cup of hot tea.

[It should be noted that they use drops and not minims; and that, when measured from an ordinary medicine dropper, about 3 drops of the oil equal a

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(3) Jour. Amer. Med. Ass'n., Dec. 23, 1916; see also Practical Medicine Series, 1917, Vol. VI, pp. 257-260.

(4) Münch. med. Wochenschr., 1913, Vol. 60, p. 129.

minim. In other words, the 15 drops dosage equals approximately 6 minims. The oil is probably best given on a teaspoonful of granulated sugar.—ED.]

The addition of chloroform to the castor oil, as recommended by Levy, is considered an important item in the treatment, as omitting it gives inferior results. R. L. Levy[5] believes that it "assists in the narcotization of the worms." Billings and Hickey use a smaller dose of chloroform than that advocated by Levy, as they found that the dose of 3 ml. of chloroform, used by Levy, was often followed by vertigo, stupor and temporary deafness. They found the smaller dose of chloroform fully as efficacious and less liable to produce untoward results.

For children, they recommend the following dosage of oil of chenopodium:

From 6 to 7 years	5 drops
" 8 to 9 "	7 "
" 10 to 11 "	10 "
" 12 to 15 "	12 "

They use a stock chloroform-castor oil solution of such strength that the dose of 20 ml. contains 2 ml. of chloroform. For children, they use smaller amounts of this stock solution, adding sufficient castor oil to make the total dose 20 ml. In the following dose table, given by them, the second column indicated approximately the amount of chloroform per dose in minims.

DOSAGE OF THE CHLOROFORM-CASTOR OIL MIXTURE.

Age	Dosage Ml.	Chloroform Minims	Castor Oil Ml.
From 6 to 7 years	6	11	14
" 8 to 9 "	8	12	12
" 10 to 11 "	12	15	8
" 12 to 13 "	14	20	6
" 14 to 15 "	16	25	4
Over 15 and under 60	20	30	..

They have not used chenopodium in pregnant women for fear of the possible oxytocic properties of the oil.

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(5) Jour. Amer. Med. Ass'n., Nov. 28, 1914.

They have used the treatment, however, in nursing women; interdicting nursing of the infant during the treatment day and for 24 hours after taking the chloroform-castor oil solution.

"On the sixth day after treatment the stool is examined; and, if found positive, another course of treatment is given and the stool again examined at the end of the second six days." (For methods of stool examination the reader is referred to the original article.)

Chenopodium Poisoning. In view of the extensive use that is likely to be made of oil of chenopodium, this becomes a subject of great importance. Though there are records of thousands of individuals having been treated with this remedy without untoward results, and Levy[7] was able to collect, in 1914, reports of only twelve cases of chenopodium poisoning in this country, in all of which the dose exceeded considerably those recommended above, it must be admitted that some danger attends the administration of what might be considered therapeutic dosage, as is evidenced by the case reported by A. F. Coutant.[8]

"A feeble anemic and malarial youth of 21, weighing only 95 pounds and suffering from hookworm, was given two doses of 10 minims each, twenty-four hours apart, or 20 minims in all. Ten hours after the second dose he was seized with colic, emesis, bloody and mucous stools, headache and tremor, fever and sweating, was critically ill and in collapse for two days, and so exhausted that he did not get out of bed for two weeks.

"A reason for this untoward result was, in all probability, the fact that the dose, which did not much exceed the one generally used for adults, was not followed by castor oil, which it is believed contributes much to the safety and efficiency of the treatment. The patient, furthermore, should not have been given an adult dose, as his weight was that of a boy of 14 or 15; hence the dose should have been one suitable for that age. The case points to the necessity for special caution and reduction of dose for individuals much debilitated by chronic disease."

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(7) Loc. cit.
(8) Jour. Amer. Med. Ass'n., Nov. 25, 1916.

The Treatment of Chenopodium Poisoning. According to M. C. Hall,[9] this should consist of large doses of castor oil, with epinephrin and digitalis used as antagonists, for as Salant and Livingston have shown, chenopodium produces a marked depression of the isolated heart.

RESTORATIVE THERAPY.

FILMS.

Film Treatment. These are sad days for the secret proprietaries. Should one be advanced that has real merit, it is immediately seized upon, analyzed, imitated, and even improved. This seems to be the fate of the dressing for burns, first elaborated by Dr. Barthe de Sandfort, of France, who unfortunately permitted himself to become snared by the commercial possibilities of the product and to sell the formula to a corporation, which exploited it under the name of "ambrine." It is nothing more or less than the simplest variety of restorative treatment, the substitution of an artificial film for lost cuticle. Petrolatum has been one of the most satisfactory dressings for burns for many years. Using a paraffin film instead has certain advantages.

T. Sollmann's[1] plea that surgeons experiment with simple preparations of known composition is well worth heeding, otherwise we shall soon have dozens of secret and non-secret proprietary preparations on the market, each of which would differ in some non-essential way from the other, while our real knowledge of the technique of this treatment would be slow in advancing.

"Ordinary paraffin, melting between 48° and 53° C., preferable about 50° C., appears to possess practically the mechanical properties of the French preparation and is urged as the standard of comparison." Such application should be used when a comparatively stiff film is desired that would separate clean from the wound.

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(9) Jour. Amer. Med. Ass'n., June 30, 1917; Practical Medicine Series, 1917, Vol. VI, pp. 260-261.

(1) Jour. Amer. Med. Ass'n., April 7, 1917.

The following formulas are suggested by Sollmann for clinical trial as preparations of increasing softness, therefore with better "soothing" quality:

Paraffin-Spermaceti: Paraffin, 10 parts; spermaceti, 1 part; or, if this be too expensive, stearic acid might be substituted for spermaceti.

Paraffin-Theobroma: Paraffin, 10 parts; theobroma oil, 1 part.

Paraffin-Petrolatum: Paraffin, 10 parts; yellow petrolatum, 1 part. This forms a soft, weak, but manageable film well worth trying on a very sensitive surface.

Paraffin Asphaltum Mixtures are, according to Sollmann, distinctly more pliable and more adhesive than the plain paraffin; however, they do not form perfect mixtures. P. N. Leech[2] gives the following formula for such a mixture:

Paraffin (120-122° F. Stand. Oil Co. of Ind.)	97.5 gm.
Asphalt varnish (B. asphaltum)	3 to 5 drops
Olive oil	1.5 ml.

About 10 ml. of "asphalt varnish" (specimen used was obtained from Remien & Kuhnert Co., Chicago) is placed in a beaker and heated on the steam bath for one-half hour. From 3 to 5 drops, delivered from a 1 ml. pipette are then placed in a casserole and 1.5 ml. olive oil added. The mixture is heated and stirred until perfect solution is effected. To this is then added, with stirring, the paraffin, which has been previously melted. When it is cooled, a brown solid is obtained, which is very pliable and strong, adheres exceedingly well to the skin, although it detaches easily. It is easily prepared and inexpensive, the cost of the materials being approximately 10 cents a pound.

The addition of antiseptic and stimulating substances is advised by A. J. Hull,[3] who believes that the wounds become clean more rapidly, pain is decreased, and the offensive smell associated with ambrine dressings is avoided, and the burns heal more quickly if this is done. He recommends the following formula:

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(2) Jour. Amer. Med. Ass'n., May 19, 1917.
(3) Brit. Med. Jour., Jan. 13, 1917.

Resorcin	**1.0 gm.**
Absolute alcohol, enough for sol.	
Oil of eucalyptus	**2.0 gm.**
Olive oil	**5.0 ml.**
Soft paraffin	**25.0 gm.**
Hard paraffin	**67.0 gm.**

Melt the hard paraffin and add the soft paraffin and olive oil. Dissolve the resorcin in absolute alcohol (soluble 2 in 1), add the alcoholic resorcin, and lastly the eucalyptus oil when the wax has cooled to about 55° C.

Even as little as 0.25 per cent. of resorcin may be used with good results.

If there is difficulty in obtaining the resorcin, 0.25 per cent. of betanaphthol may be substituted.

Generally, the paraffin treatment may be begun with the first dressing. Only very exceptionally, in very septic burns, is the paraffin replaced by boric acid fomentations for two days after two days of paraffin treatment.

The burn is washed with sterile water and dried by placing dry gauze over the burn; or, better, by means of a hot-air electric dryer.

The burn is next covered with a layer of paraffin at a temperature of 50° C. The proper temperature may be approximately estimated by waiting until the melted wax shows a film of solidification upon the surface. It is better to use either one of the following two devices, recommended by Sollmann for the purpose: An electric food warmer, such as is sold for the warming of babies' milk bottles, or else an "acetate thermostat." This depends upon the property of sodium acetate of melting and congealing at just about the temperature needed for the application of the paraffin, and it retains its temperature for several hours. The best device for the latter purpose is an ordinary glue pot of size O. The outer pot is filled two-thirds with official sodium acetate (a little over a pound). The inner vessel holds about a pound of paraffin. A broad camel's-hair brush, sterilized in wax, affords a rapid and ordinarily painless method of applying the paraffin. It is better, however, to spray it on by means of a metal atomizer of rather large bore (Fig. 2). Spraying is necessary in very painful cases and with children. The atomizer must be immersed in hot water during use.

As soon as the wound shows a smooth, glistening, waxy surface, a thin layer of cotton, or a single layer of gauze, cut to the size of the area involved, is applied; and a second layer of paraffin is sprayed or painted on. The thin layer of cotton is best obtained by separating the thinnest possible sheet from the roll, and pressing this sheet between layers of paper.

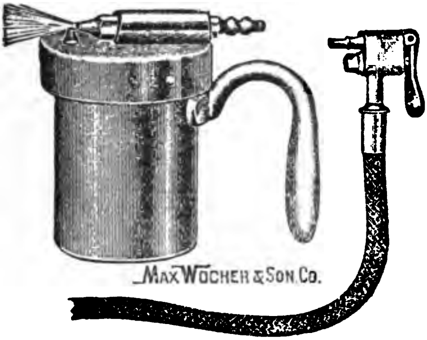
MAX WOCHER & SON CO.

Fig. 2. Apparatus for spraying paraffin.

The dressing is completed by putting on aseptic gauze and a roller bandage. The dressing is removed daily, which can be done easily and quickly, as it does not adhere. When the burn is clean and but little pus is formed, changing the dressing every forty-eight hours suffices.

The rapidity of healing, the absence of pain and sepsis, and the resulting healthy new skin without contractile cicatrices or deformity are reported to be truly remarkable.

The film treatment has not only been used for burns, but also for the treatment of other extensive granulating surfaces, such as frost bites of the second degree and for the granulations left by the eschar from those of the third degree; also as a dressing for sterile war wounds.

[It seems that these films might also be of value in the treatment of extensive skin lesions.—Ed.]

Paraffin coating of bandages is suggested by T. Sollmann[4] by painting the surface of the finished dressing with melted paraffin, for the purpose of fixing it in place, or stiffening it so that it form a light splint, and of protecting the bandage against moisture and dirt.

IMMUNIZATION THERAPY.

[It seems that this is the most appropriate heading under which to discuss not only antitoxin and vaccine therapy, but also desensitization of hypersusceptibles (anti-anaphylaxis), as well as the induction of pyrexia by various agencies (such as injection of vaccines and of protein-split products, or of external heat), and possibly even the general metabolic stimulation produced by heliotherapy.

Of the two varieties of immunization—active and passive—only the former will be considered here. For passive immunization, such as the antitoxin treatment of diphtheria or of tetanus, are so intimately connected with the special diseases in which they are used that they are best taken up in connection with them in the special portions of this series. Active immunization has had some interesting developments within the year, most especially in connection with the question of the specificity of vaccine treatment; and of the nature of anaphylaxis, of its prophylaxis and treatment.—ED.]

Autotherapy. This is defined by C. H. Duncan,[5] its originator, as employing the exact unmodified substance that caused the disease as the curative remedy. It must not be considered an example of homeopathy, for homeopathy uses as the cure a substance that causes a similar set of symptoms, while autotherapy uses exactly the same substance that caused the disease to cure it.

Autotherapy in ivy poisoning[6] is a good example of this practice. In Fairmount Park, Philadelphia, it was the custom, says Duncan, to instruct new park hands, set to clearing away poison ivy, to chew a few leaves of the plant as a preventative to the well-known cutaneous eruption. Last spring this autotherapeutic method was

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(4) Jour. Amer. Med. Ass'n., April 21, 1917.
(5) New York Med. Jour., Nov. 4, 1916.
(6) Ibid.

introduced in Bronx Park, and several of the workmen employed it as prophylactic. It is noteworthy that no one who chewed the leaves suffered afterward from poisoning. Duncan also cites a case of ivy poisoning in which he instructed the patient to "select a leaf from the particular plant, a part of which he was instructed to chew and to swallow the juice. This he did. There was a reduction of swelling, the symptoms of itching and burning rapidly subsided, so that within three days he was able to resume his duties." As there are several species of ivy, it is necessary to give such instruction, otherwise some other ivy might be given. This method of treating ivy poisoning has long been known and practised by homeopathic physicians. Duncan also refers to an article by J. M. French[7] in which it is stated that ivy poisoning may be cured or prevented by chewing the young leaves of the plant and swallowing the juice.

Autotherapy in Infections. A recent issue of the *Western Medical Times*[8] contains a symposium on "Autotherapy," headed by an article on *"How Autotherapy Was Discovered,"* by C. M. Duncan, in which he relates a case of infected compound facture of the leg, the suppuration from which cleared up within two days after a few drops of the pus taken from the wound was placed in the patient's mouth. To make the treatment more elegant, Duncan next filtered a dilution of the pus through a Berkefeld filter, and gave the filtrate to patients both by mouth and hypodermically. The results were startling: "Acute bronchitis, cured within twenty-four hours; pneumonia and spinal meningitis in the early stages were checked almost instantly; endometritis, salpingitis, mastoiditis, otitis media, acute gonorrhea, cystitis, etc., were usually cured quickly, and the curative reaction was apparent often within a few hours, and it tended to be permanent. As one after the other of these infections was conquered, it was realized that a great secret of nature had been discovered and demonstrated beyond all shadow of doubt." "The plans of nature in curing the sick do not include immu-

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(7) Clinical Medicine, August, 1916.
(8) October, 1916.

nization of the patient with heterogenous toxins, nor even with modified partial autogenous toxic substances; but she foreordained that the patient should be cured with his own unmodified toxin-complex or the toxins developed within his own body by the action of the infecting agents upon the body tissue.''

Autotherapy vs. Vaccine Therapy. M. L. Curtner[9] has the following to say on this topic:

''Sir Almroth Wright was the first of modern biologic investigators imperfectly to grasp the idea of the great value of autogenous therapy. But Wright lowered the therapeutic value of his autogenous vaccine from being a part of the exact remedy (the exact remedy for an infection is the unmodified tissue-toxin-complex developed by the action of the infectious agent upon the body tissues, or the substance that caused the symptoms of disease), by the elaborate process which it undergoes during its preparation. Its therapeutic value is lowered first, by heat; second, by being grown on artificial culture media, thus not containing the natural unmodified tissue-toxin-complex; third, there is difficulty at times in growing all of the bacteria present in the focus of infection; fourth, Sir Almroth is not always certain that he has the causative microörganism isolated and reproducing upon his artificial culture media.

''In autotherapy all the above injections are absent.'' . . .

''Mistakes may be made at first by overdosing the patient, and too frequent administration of the antigen solution. The dosage must be regulated as to size and frequency by the reaction of the patient. In some cases, systemic reaction must be aroused to obtain good results, while in others it is not necessary to produce an apparent local reaction at the site of the injection. In some chronic conditions I have found that intravenous injection of the antigenic solution must be given to obtain the best results. . . . When I first began the use of autotherapy I did not obtain as good results with it as I now do, and you will not either.

''I use autotherapy in every instance where I am able

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(9) Western Med. Times, October, 1916.

to obtain any pus or other pathologic discharge that contains the causative organism, and find that I obtain better results with it, than by the use of drugs.''

The Technique of Autotherapy. This is incidentally and not very satisfactorily described by several of the contributors to the symposium. P. T. Geyerman[1] reports, among others, the following case, which is given in detail because it tells more about the method than most of the reports:

''Case I. Lobar pneumonia. A. E. S., 36, male American. Unresolved pneumonia. Duration, seven weeks. Original focus in left lung posteriorly. Temp., 104 to 105° F., early in the course of the disease, with considerable cyanosis. At the end of two weeks the evening temp. was 100 to 101° F., pulse 96 to 105. At the end of three weeks an autogenous vaccine was made and given at three-day intervals with very little improvement at the end of two weeks more. At this time an autofiltrate was made from the sputum using about one dram of the sputum and one ounce of distilled water, allowing it to stand for twelve hours before filtering. Ten minims were injected under the skin, which was followed by a rather severe local reaction with a little further rise in temperature. At the end of forty-eight hours there was no noticeable change in the condition of the patient when another filtrate was made and of this twenty minims were injected, followed by some local and general disturbance. In twenty-four hours the temperature dropped to normal and pulse to 86. After three days another injection of the same filtrate was followed by a slight rise in temperature, which dropped to normal in twelve hours. No more injections were given after this, as the patient's condition was such that it was not considered necessary. The patient left the hospital at the end of another week feeling well.''

Of other cases reported by Geyerman, only the most salient features will be given:

Case II. Chronic bronchitis . . . for past seven years. . . . Complete cure in four weeks.

Case III. Bronchial asthma . . . of five years'

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(1) Ibid., p. 134.

standing. . . . Practically a complete cure followed in three months.

Case IV. Chronic cough for past four years. . . . Was given autogenous vaccines for a period of four months with some improvement, though she still coughed considerably, and there was very little or no diminution in the amount of the sputum. At this time a filtrate was made in the usual way and administered at five days' intervals. She began to improve after the second injection and was completely well at the end of eight weeks.

Modification of Technique. C. E. Fenner[2] says: "The only difference in my method of procedure from that of Dr. Duncan, who is the father of autotherapy, is that I employ an incubator to keep the pabulum at blood temperature for from six to twenty-four hours before filtration and therefore sterilization. If I am to keep the filtrate for future use I make the filtrate one-half per cent. phenol as a preserving agent, and I never give more than five minims as the initial dose."

[I shall not burden these pages with reports of cases, a considerable number of which can be found in the original papers. While some of the results seem truly remarkable, many of them would not stand criticism any better than the average "patent-medicine" testimonial. —Ed.]

Vaccine Therapy. *The limitations of vaccine therapy* are becoming recognized, as is evidenced by a number of papers on this subject by R. J. Rowlette,[3] by D. J. Davis[4] and by James P. Leake.[5]

Rowlette has this to say regarding new forms of treatment, in general:

"It is notorious that no judgment in medical practice is more difficult than the estimation of the value of a particular method of treatment. A new method is introduced, it wins a certain amount of favor, it may become the fashion, and unless it is accompanied by some obtrusive disadvantages or dangers, many of us are convinced that the treatment is, if not 'the last word,' at

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(2) Ibid., p. 136.
(3) Lancet, June 30, 1917.
(4) Jour. Amer. Med. Ass'n., Jan. 20, 1917.
(5) Jour. Amer. Med. Ass'n., Aug. 25, 1917.

least 'a distinct advance,' and we go on with it until a new fashion takes the place of the old. Our reasoning on these matters is never logical, and rarely individual. We are governed by laws—if laws they be—of herd psychology. Our conclusions are instinctive, not conscious."

Specificity and success of preventive inoculation. All the authors agree that, for certain few diseases, the prophylactic use of specific vaccines has been successful, but in the great majority of infections it has not been successful to any appreciable degree. The successful instances, in man, are: The Pasteur treatment of rabies (which is in reality protective, not curative), the prevention of smallpox and of typhoid fever and, less definitely, of plague and of cholera. These marked successes establish a practical and rational basis for their possible value in all infections; but, in most other instances, the value still remains to be determined.

Action and limitations of curative treatment. Davis says: "*A priore,* on the basis of immunity principles, we could hardly expect to obtain better or even as good results when the virus is introduced during the course of the disease as when introduced previously. What are the facts? It was early observed that vaccination with cowpox virus during or after the onset of smallpox had no effect on the course of the disease. Pasteur was well aware of the possibilities of a curative therapy as well as of a prophylactic one, but he reports no results of importance along curative lines. Even to this day it is interesting to note that in the domain of animal diseases, which have been so fertile in furnishing valuable data for prophylactic therapy, there are no natural diseases known in which vaccines for curative purposes have been of any appreciable value. Indeed, there is empirical evidence that vaccination just before or during an attack of disease may do harm. Veterinarians are careful not to expose cattle to infection soon after they have received prophylactic anthrax vaccine." Davis concludes: "The important domain of vaccines is protective, not curative, according to present data."

Rowlette says: "A vaccine is not a new ally in the fight between the parasites and the host, assisting the latter to destroy the former. It is only a stimulus to the body to exert to the full its natural powers of resistance and protection. Of itself it can do nothing . . . As the action of vaccines is merely stimulative of certain natural powers of the body, it is clear that if the body is already exhausted, if it is no longer able to produce the substances, the vaccine fails. Moreover, in cases in which it does not fail, its success is proportional to the powers of the tissues to respond to its call. To expect uniform success from vaccines is, therefore, as unreasonable as to suppose that the body can never fail in its defense against disease."

"It follows that the cases in which we may expect the best results of vaccine treatment are those in which (1) the body has not yet lost its natural power of resisting infection, and (2) in which there has not been great tissue change. If the body has no power of resisting infection the vaccine is quite inert. It is as useless as a trumpet-call in a deserted barrack-square. . . . If gross tissue changes have occurred, they can not be repaired by vaccines. It would be as reasonable to suppose that, if the invaders were tomorrow driven from the fields of Flanders, those fields would be restored forthwith to the condition in which they were three years ago. The battle may be over, and the invaders destroyed, but many of the traces of battle are ineradicable, while others will persist for years. Louvain and Ypres will never be again what they were three years ago. Neither will the heart valves that have been eroded and fibrosed in the battle between the infecting cocci and the protective agencies of the body be the same again.

To this the editor would add (3) from G. M. Coates'[6] article on "Clinical Experience with the Use of Vaccines in Diseases of the Ear, Nose and Throat," that "vaccine therapy, much as may be hoped from it in the future, will probably never supersede the surgery necessary for drainage and for the correction of abnormalities that by their presence keep up irritation of the tissues and thus are conducive to reinfection by the same or another type of organism."

While Davis and Rowlette agree upon the specificity

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(6) Jour. Amer. Med. Ass'n., Jan. 20, 1917.

of preventive inoculation, they differ somewhat on the question of specificity of the curative use of vaccines, thus representing the two divergent views that are being held regarding this question at the present time.

The specificity of the curative use of vaccines is taken for granted by Rowlette, who says: "The question is not infrequently asked: In what class of diseases should vaccines be employed? The answer, bearing in mind the limitations I have already suggested, is: Every infective disease due to bacterial origin in which the bacterial cause can be discovered. The acuteness or chronicity of the condition is beside the point, though it may have much to do with the method of administration. A similar remark applies to the question whether the disease is general or local. In every case where a fight is going on between the body and an invading bacterium there is reasonable hope that the defensive forces will be strengthened by the administration of a vaccine. But, as vaccines are specific, a correct bacteriologic diagnosis is necessary. In this, vaccines are at a distinct disadvantage if contrasted with other methods of treatment. By rest, suitable food, good nursing, and relief of unpleasant symptoms we cure, or rather assist Nature to cure, many of our patients. If before treating them an accurate diagnosis were necessary how many successes would we have? But if vaccines are to have any effect at all their use must be preceded by correct diagnosis. We must be sure that we are treating with the infecting organism. Of course, if the infection be mixed, as is so often the case, we must often be content to treat with a group of organisms—*i. e.* with a mixed vaccine—being assured that at least one element in our vaccine is specific for the infection, and that the others, if not helpful, are at least harmless."

That alleged specific results are frequently due to lack of proper controls, is the belief of Leake, who cites Captain Whittington's series of typhoid fever patients treated with vaccine compared with controls, in which the controls did better than the treated patients. He also cites experiments carried out by the New York City Health Department, under Dr. Park, in which pertussis vaccine was found to show no superiority over the non-specific treatments.

Dr. Billings found that personal and general hygienic management will accomplish quite as much with as without vaccines; and that vaccines without proper attention to hygienic management are more likely to be harmful than helpful. Leake's plea is not for the utter abandonment of therapeutic inoculation, but for its better control, and for the collation of such reliable data as will more clearly guide our future use of the method.

An editorial in the *Journal of the American Medical Association,*[7] commenting on Leake's article, reminds us of Bacon's saying: "If false facts in nature be once set on foot, what through neglect of examination, the countenance of antiquity, and the use made of them in discourse, they are scarce ever retracted."

[Let us therefore be careful in our publications to remember that we must first of all ever be in the service of the truth.—Ed.]

The non-specific character of the curative use of vaccines is strongly advocated by Davis,[8] who states: "Recent work tends to show that many substances, the so-called foreign proteins and their derivatives, may, when injected especially into the veins, quickly cause a severe chill followed by high fever, leukocytosis and certain changes in the blood, especially the appearance of ferments. These proteins may be derived from disease germs or they may consist of other animal substances, such as serum, proteoses and milk. After the rather severe reaction, marked improvement and even permanent cure may result in certain diseases, especially in typhoid, and in rheumatic and gonococcus infections. This may be due to the high fever and to increase in ferments and leukocytes of the blood. Other factors are probably at work.

"At the present moment the facts would seem to indicate that the non-specific substances referred to are able to do almost everything the specific vaccines have done in the cure of disease. In other words, the curative effects of vaccines reported heretofore may be ex-

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(7) Aug. 25, 1917.
(8) Loc. cit.

plained by the action of the non-specific substances in the vaccine rather than by its specific factors.

"Jobling and Peterson[9] in their analysis of the mechanism of the action of non-specific therapy, call attention to a number of factors involved in this process. Selective stimulation of the hematopoietic tissues occurs, which results in flooding the body with antibodies which are specific, but the stimulus may be non-specific. Hyperpyrexia and leukocytosis, emphasized especially by Gay and his associates in recovery from typhoid by this form of therapy, and the mobilization of serum protease and lipase, with an ultimate rise in the antiferment titre of the serum following injection of various foreign substances, are considered significant processes. These processes, they suggest, are dependent on certain changes resulting in the state of increased dispersion of colloids affecting both the serum proteins and the serum lipoids. Such changes are able to be brought about by a variety of substances which result in reactions clinically and therapeutically almost identical.

"In case it is shown conclusively that, for therapeutic purposes, any foreign protein may serve, the logical preparation for use would seem to be a sterile pure chemical preparation of some proteose, which can be carefully standardized. Such a substance would be far more reliable and satisfactory than the various vaccine mixtures and extracts now flooding the country.

"Subcutaneous injection of foreign protein may behave quite like the intravenous injections, though the action is slower and the dose required for the effect is probably somewhat larger. On account of the very severe reactions occurring at times after the intravenous method, the question may be properly raised as to its possible dangers. Evidently further data are needed here, but if a proper reaction can be elicited by subcutaneous use, this route might be preferred on account of simplicity and perhaps safety. Even subcutaneous use of large doses may not be entirely free from harm.

"The non-specific effect of vaccines is just now probably the most important problem that concerns the vac-

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(9) Jour. Amer. Med. Ass'n., June 3, 1916.

cinationist. The possibilities of development along this line are many, for the principle concerns an immense number of diseases, both in man and in the lower animals. . . . This form of treatment should be referred to neither as specific nor as vaccine therapy. It is non-specific, and usually, but not necessarily, protein therapy.''

[We shall discuss this treatment presently more in detail under the heading of ''non-specific stimulation of resistance.''—ED.]

Specific vaccines may be of advantage, Davis admits, ''in such infections as the local staphylococcus infection of the skin and in some others in which, since Wright's first work, so many favorable reports have appeared. Here it is quite possible that so far as immediate results are concerned a non-specific foreign protein might act as well. However, in such cases there seems to be another factor concerned, namely the specific immunity factor operating to prevent a recurrence of the infection. The non-specific protein would probably not influence this factor and the use of autogenous organisms would be desirable for its immunizing effect. Therefore, *where both a curative and preventive effect is desired, it would seem that the autogenous vaccine would be advantageous over a non-specific protein substance, which might have only a curative action.''*

A. K. Detwiler[1] agrees with Davis in every respect, frequently using practically identical sentences.

Other treatment synnergistic to vaccine treatment. Rowlette[2] emphasizes the following points of practical importance: ''No greater misconception can exist than the notion that vaccine treatment is incompatible with the use of other methods of treatment. On the contrary, one rarely gets the best results from vaccine treatment unless one makes full use of whatever concomitant measures his own experience or the accumulated experience of others may suggest. Few drugs are in any way inimical to the action of vaccines, and those that are, are depressant to the natural resistive powers of the body, and are therefore contraindicated in the class of

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(1) New York Med. Jour., June 2, 1917.
(2) Loc. cit.

diseases in which vaccines are employed. Of these the only drug in common use is alcohol, the employment of which in septic diseases should by now be obsolete except under rare conditions. Vaccine treatment, therefore, goes side by side with treatment by drugs.

"In surgical conditions, operative measures, or anything else that surgical knowledge suggests should, of course, be practised when required. The only precaution to be observed is to withhold inoculations in immediate proximity to any manipulative proceding which may give rise to auto-inoculation. Otherwise vaccines, of course, act in their normal manner of increasing the protective power of the body."

Mixed Vaccines. *Triple typhoid vaccine* is now to be used in the immunization of the soldiers of the United States army, according to C. F. Craig.[3] The vaccine is composed of 1,000 million typhoid bacilli, 750 million paratyphoid *A* bacilli, and 750 million paratyphoid *B* bacilli per ml. The first dose is 0.5 ml., and the second and third doses are each 1 ml., the inoculations being made subcutaneously at intervals of seven days. Severe physical exercise is forbidden for twenty-four hours after the inoculation, and the men are excused from drill, but attend to all other duties as usual.

The general as well as the local reactions were no more severe than those that follow the use of typhoid vaccine alone, and did not appear as severe as that following the use of paratyphoid vaccine alone. It was, in the majority of cases so slight as to be negligible. The important thing is that the vaccine be carefully injected *subcutaneously,* not intradermally, intramuscularly or intravenously. The agglutinin titre for each of the three organisms was satisfactory and indicated that the combined vaccine produces antibodies for all three organisms as well as when each is injected alone.

The Value of Preventive Inoculation of Mixed Vaccines. This is discussed by A. Fleming.[4] In the prevention of the "enteric group" of diseases, a mixed vaccine composed of 1,000 millions typhoid baccilli and 500 millions each of paratyphoid *A* and *B* is used, (Cop-

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(3) Jour. Amer. Med. Ass'n., Sept. 22, 1917.
(4) Practitioner, April, 1917.

pinger and Gibson), of which half a mil is given for the first inoculation, and ten days later one mil. Very good immunizing response in the inoculated men followed; and, though it appeared to them that the reaction began earlier and the local reaction was definitely greater with the mixed vaccine than when typhoid vaccine alone was used, this slight drawback is more than compensated by the immunity to paratyphoid, which is not obtained when typhoid vaccine alone is used. Thus Rowlette says: "Our troops have been inoculated against typhoid but not at first against paratyphoid. We know how rare has been typhoid, although paratyphoid, hitherto regarded as a rare disease, has been in some areas by no means uncommon." It has been shown that immunity response, as measured by agglutinins, is more rapid when a single vaccine is given, although, after two weeks have elapsed, the results are much the same with the single and the mixed vaccine. Hence, when an immediate effect is wanted, as, for instance, the immunization of the community after the outbreak of an epidemic, it would be wise to use a single vaccine; whereas, when it is lasting effect which is aimed at, the resultant immunity is as good when a mixed vaccine is given.

Mixed vaccine in prophylaxis against pneumonia. Fleming quotes F. S. Lister's work done in South Africa, in which he finds that immune bodies for all the types of pneumococci can be produced by using a mixed vaccine containing all the groups. Injections were made intravenously and subcutaneously, and it was found that, by the intravenous method, the optimum results could be obtained with a much smaller dose of vaccine, though the same results could be produced by the subcutaneous method, if the dose were sufficiently increased.

As intravenous inoculation on a large scale would present difficulties, Lister advocates three subcutaneous inoculations, at weekly intervals, of 6,000 millions of each of the groups of pneumococci against which it is desired to immunize the individual. If there be five prevalent groups, this would make the formidable total of 30,000 million pneumococci at each injection, which however produces less of a reaction than is obtained with ordinary prophylactic typhoid vaccine. The vaccine was able to protect rabbits against eight times the lethal dose of living pneumococci.

It has been argued against the success of prophylactic inoculation for pneumonia, that not infrequently a second attack of pneumonia follows soon after the first. Lister believes this argument fallacious, because, in the first place, the immune bodies in the blood following an attack of pneumonia are less in quantity and disappear sooner than after inoculation of large doses of vaccine; and, secondly, in cases in which the type of pneumococcus causing the second attack has been investigated, it was found to be different from the type which caused the first attack; and it is not to be expected that pneumonia caused by pneumococci of one type will confer immunity to pneumococci of another type.

Value of Polyvalent Pneumococcus Vaccine in Early Pneumonia. G. H. Sherman[5] advocates the use of polyvalent pneumococcus vaccine, with the addition of streptococcus and staphylococcus, at the earliest possible moment. If such vaccine is given within a few hours after the chill, he claims, lung consolidation can be prevented in the majority of cases, the temperature will come to nearly normal within twenty-four hours; and, by repeating the inoculation at one or two day intervals for three or four treatments, a large majority of patients will be well on the road to complete recovery within four or five days from the onset of the symptoms. If the vaccines are given later, . . . as a rule recovery will be by a slow but favorable lysis, and extension of the inflammatory process to new lung areas can be avoided. In advanced cases with but few exceptions no result will follow. . . . Sherman furthermore believes that cases of pneumonia, in which vaccines were employed, are more thoroughly immunized than where spontaneous recovery takes place, and that the person treated by immunization is far less liable to subsequent attacks than where vaccines were not employed.

The rationale of this treatment depends, according to Sherman, upon the difference between the antigenic properties of live virulent organisms and those of the

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(5) New York Med. Jour., April 28, 1917.

dead germs. The very fact that a person's blood-stream has become invaded with pneumococci shows that the resistance of such a person to that particular organism is *nil,* so that few if any pneumococci are being destroyed by the phagocytes; the pneumococci not being sensitized and being virulent to that particular individual, the phagocytes can not attack them. In case of such blood infections—and this is not only true for pneumococcus infection, but also for streptococcus and staphylococcus sepsis and for typhoid fever—localization of the infection with tissue involvement is essential to free the blood from the infecting organism.

"That is, while germs are circulating in the blood as the result of a natural source of infection, no material influence is brought to bear on tissue cells for antibody production until the tissue cells themselves become involved in the infective process, and the progress of the case will be in direct proportion to the amount of antibody that will develop as a result of such tissue involvement. If cell sensitization for a specific ferment or antibody production develop rapidly, these antibodies will combine with the germs circulating in the blood, sensitize them, put their digestive mechanisms out of commission, and make them susceptible to phagocytosis. During this process of ingesting and digesting microörganisms by the phagocytes, they also secrete ferments which have a destructive influence on other germs, and in turn render them susceptible to phagocytic action. By this means this germ-destroying process becomes cumulative and what appears to be a desperate condition may clear up within one or two days. If tissue cells would always become adequately sensitized for antibody production from localized infections, spontaneous recovery would be the rule, but unfortunately live virulent organisms do not always possess sufficient antigenic properties to stimulate adequate antibody formation; on the contrary, through their destructive influence tissues are often crippled or hindered in producing antibodies.

"If we inject into healthy tissue a suspension of killed organisms of the same kind that prevail in a pneumonic infection, . . . the tissue cells become actively engaged in eliminating them by a process of digestion through the action of cell secreted digestive ferments. Being killed, the germs can not secrete ferments that have a destructive influence on the tissue cells, consequently the entire cell energy may be devoted to specific ferment or antibody production. After tissue cells have once become trained, stimulated and sensitized into antibody production, they, as a means of guarding against similar germ invasion, continue to produce this specific ferment for some considerable time after the intruding organisms are disposed of. These specific ferments by means of the circulating mediums are conveyed to at least some of the infecting organisms, combine with them, sensitize them, rob them of their virulence by interfering with their digestive function, and thus make them susceptible to phagocytic action. Phagocytes, while ingesting and digesting these sensitized pneumococci will in turn become sensitized and continue to produce specific ferments which will unite with other pneumococci and render them susceptible to destruction; and as this process continues this sensitizing actively becomes cumulative.

"The question of dose is very important. . . . Stock vaccines are usually prepared in suspension so that, 0.3 ml. would represent the usual initial dose in minor acute or chronic infections, but in extensive acute conditions like pneumonia, treatment is started with 1 ml. and the dose repeated at daily intervals for the first few days until the extremely acute symptoms have subsided; whereas in chronic infections vaccines are given from four to seven days apart. In extremely severe cases it is even advisable to give the vaccine twice daily for three or four inoculations. After the temperature has come to normal with the heart condition and other clinical symptoms favorable, if the temperature should then rise again this would indicate that the immunizing resistance is falling back and would indicate that another dose of the vaccine should be given at once. After the temperature has settled down to normal the vaccine should be given at two to four day intervals until the lungs have entirely cleared up.

"Vaccine treatment does not interfere with any other treatment. . . . The question of keeping the patient in bed under the vaccine treatment is very important, because the patient frequently feels so well that remaining in bed seems like a hardship. There is nothing that will break down immunizing resistance like fatigue. If the patient is doing well, it is not wise to allow overexertions to break down the resistance which has been developed.''

[The use of carefully collected controls, as pleaded by Leake, is earnestly to be desired in connection with the use of pneumococcus vaccine, as advocated by Sherman.—ED.]

Prevention of pneumonia resulting from "colds," Sherman[6] believes entirely possible, if the patient is immunized during the minor infection. I have never seen or heard, he says, of a case of pneumonia developing where the preliminary cold was treated with bacterial vaccines.

Mixed Vaccines in Prophylaxis Against "Colds." According to Fleming[7] these have been "highly successful in practice.'' Rowlette[8] says that "successes have been sufficiently numerous to justify us in the hope that with a more intimate knowledge of the bacteriology of the respiratory tract, and most especially with the development of knowledge of a correlation between the different species of bacteria, we may soon be in a position to judge what class of cases may be satisfactorily treated and what class of cases we cannot expect to influence. Influenza, for instance, does not appear to confer immunity that lasts for any length of time. Hence in case of such disease we are not likely to produce a persistent effect by preventive inoculation.''

G. M. Coates[9] says that the mere fact that vaccine for the prevention of acute rhinitis or common cold has come into such general use by physicians and general demand by the laity would indicate at least some value in this method. Most of the immunization is necessarily done with the aid of commercial mixed vaccine of the many well-known different brands on the market. In case the patient is subject to repeated acute colds, cul-

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(6) Loc. cit.
(7) Practitioner, April, 1917.
(8) Lancet, June 30, 1917.
(9) Jour. Amer. Med. Ass'n., Jan. 20, 1917.

tures taken during one of these may be used for vaccine preparation and prophylaxis against future ones, with most excellent results.

Mixed Vaccines a Fallacy or Fetich in the Treatment of So-Called Mixed Infections. I. S. Kahn[1] has this to say on the subject: "A smear from a syphilitic chancre shows innumerable organisms in addition to the *Spirochaeta pallida,* yet the organisms in no way deter from the immediate healing of the syphilitic ulceration, once the spirochetes are removed by appropriate constitutional measures. In chronic gleet, the expressed prostatic secretion shows only a few gonococci while other organisms are extremely numerous. Still it must not be forgotten that the resulting infection in the wife of such an individual is not a pseudo-diphtheritic endometritis or a Friedlander bacillus pyosalpinx, but plain old-fashioned gonorrhea. Again, a smear from an extensive diphtheritic throat membrane, no matter how carefully made, shows all sorts of contaminating or attendant organisms, often far exceeding in number the diphtheria bacilli present; still, curiously enough, these other organisms possess no influence whatever in detracting from the efficiency of diphtheria antitoxin. I ask, according to bacteriologic smear findings, do not these instances mentioned merit the term 'mixed infection'? In the same way, in incipient tuberculosis, almost every germ ever heard of will be found in the sputum before the tubercle bacillus can be demonstrated, and in most smears from positive tuberculous sputa the numerical proportion of tubercle bacilli to other cocci and bacilli present is almost infinitesimal."

He therefore deduces:

1. The mere presence of organisms in a discharge does not mean that they are all causal factors. They might even be antagonistic to the true causal organism.

2. The predominating organism may not be the causal factor, which latter may be present in smallest number or not found at all, as in many a discharge from tuberculous lesions. Almost no faith whatever should be placed in findings revealing more than a single organism, unless in such multiple findings the various organisms

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(1) Texas State Med. Jour., May, 1917.

are intracellular. In respiratory diseases, the bacterial findings are dependable only, when the sputum is absolutely fresh, and so tenacious in its consistency as to permit of washing or of searing the surface with heat.

Kahn believes that, in point of fact, mixed vaccines generally do not contain the causal organism, which is fortunate for the patient. For "were such vaccine actually to contain the etiologic strain of bacterium, its administration in any acute infection, in such doses as are put up both in stock vaccines and by the usual pathologist, would result, through excessive negative phases, in delaying rather than in hastening cure. The view that the contaminating germs in a mixed vaccine, if they do no good, at least do no harm, may be shown to be erroneous, as there are two dangers: first, harm may be done through anaphylaxis; and secondly valuable time may be wasted through ignoring the real pathologic condition.

NON-SPECIFIC STIMULATION OF RESISTANCE.

Pyretic Therapy. Induction of pyrexia by means of vaccines or of other foreign proteid has been found strikingly effective, especially in arthritis, acute, subacute, and chronic, by J. L. Miller,[2] by H. B. Thomas,[3] and by Francis J. Scully.[4] The fever was induced, by all these investigators, chiefly by means of the intravenous injection of typhoid vaccine, though in a few cases proteose and chicken serum were used with apparently the same results.

Miller considers "commercial vaccines unreliable on account of the variable amount required to give the desired reaction. With the freshly prepared vaccine the dosage has ranged from 40 to 150 millions. When beginning the use of a fresh supply of vaccine, its toxicity was determined by beginning with a small dose of 40 million and then increasing until the desired reaction was obtained. This precaution is advisable, as the toxicity of the vaccine may be quite variable. With few exceptions the vaccine has been given intravenously."

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(2) Jour. Amer. Med. Ass'n., Sept. 8, 1917.
(3) Ibid.
(4) Jour. Amer. Med. Ass'n., July, 7, 1917.

Thomas says: "In subacute and chronic cases of osteo-arthritis one makes no mistake if he prescribes 50 million typhoid vaccine intravenously, and in those cases which react only moderately cautiously raises the amount at intervals of two or three days to 75 million bacteria at one injection."

The effect of these injections was studied most carefully by Scully.[5] "For half an hour to an hour there is no apparent change in the patient's condition. Then a chill occurs, which may become quite severe, and is accompanied with the usual symptoms of cyanosis and rapid pulse. With the onset of the chill the patient complains of a dull temporal headache; nausea and even vomiting may be frequent at this time. The chill lasts for from fifteen to thirty minutes and subsides gradually, the headache and nausea passing away with the chill. Following the chill there is a rise in temperature, (103° to 105° F.) reaching a maximum about three or four hours after the injection and falling to normal in forty-eight hours. There is a fall in leukocytes followed by a marked increase reaching a maximum six hours after, and gradually falling to the same level as before the injection. There is considerable variation in the differential counts, but the main change is an absolute

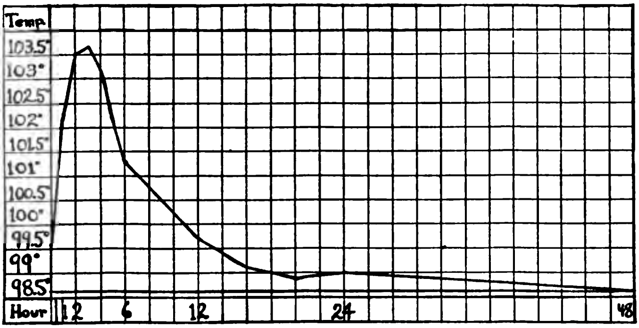

Fig. 3. Composite temperature curve following forty-seven intravenous injections of typhoid vaccine in twenty-five cases of acute articular rheumatism.

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(5) An abstract of Scully's article appears in Practical Medicine Series, 1917, Vol. VI, pp. 11-12.

and relative increase in the neutrophiles. The blood-pressure rises during the chill, then falls, remaining low for three or four hours, and rising gradually to normal. The urine shows no definite change following the reaction."

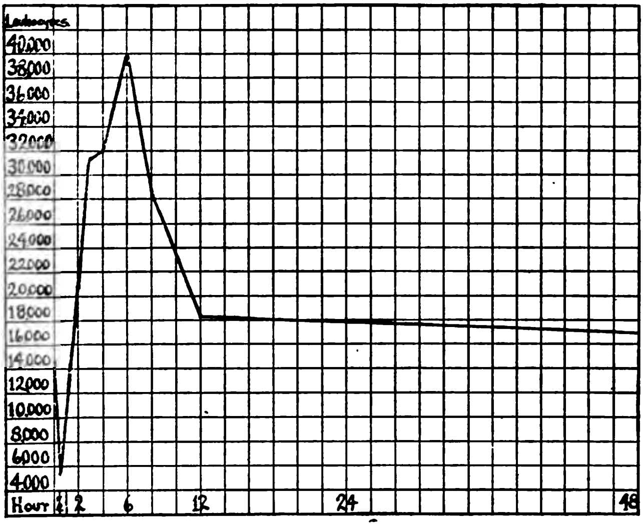

Fig. 4. Composite leukocyte curve following forty-three injections in twenty-four cases of acute articular rheumatism.

When patients receive repeated injections, not infrequently the reaction becomes less marked with each successive injection.

The most striking result of this treatment is the early relief of pain. In Miller's series of ninety-three cases, eighty patients were relieved of their pain and soreness or greatly benefited by from one to four injections, six showed only moderate improvement, and seven were not helped. "The behavior of the acute arthritides to foreign protein is not unlike that of profuse sweats observed after large doses of salicylate, as after either of these means marked amelioration of the symptoms is observed." Thirty-three of these patients had not been benefited by salicylate; and yet all except four of these were promptly, at least temporarily, greatly benefited by the typhoid vaccine. It is quite as efficacious in gonorrheal arthritis. However, recurrences after apparent recovery are the rule, these taking place within twenty-four hours to ten days or more. Apparently the effect of the treatment is confined to the joints, the primary focus escaping. Acute endocarditis did not seem modified by the treatment.

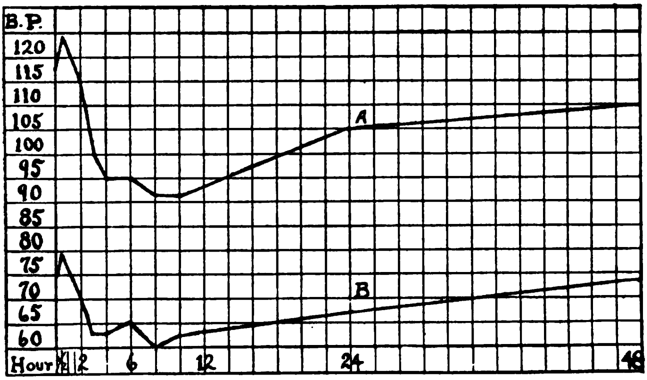

Fig. 5. Composite blood pressure curve following vaccine injections in acute articular rheumatism.

In Miller's series of 200 cases, there were four alcoholics who developed marked delirium soon after the injection and one of these patients died within fifty-four hours. Dyspnea and cyanosis were noted in a few cases. The urine never showed more than transitory albuminuria. Patients with hypertension, marked valvular lesions or myocardial changes were not subjected to the treatment. When the infection was very acute, as shown by the temperature, the dosage of the vaccine was reduced. With his present experience, Miller would not subject marked alcoholics to this treatment. He believes that this treatment must still be considered in the experimental stage, and careless administration guarded against.

Encouraging results were also obtained in subacute and chronic rheumatism. In such cases, Thomas has given from twelve to twenty-four such treatments over a period of from one to two months, with the result that most of the patients were able to leave the hospital as cured. Thomas considers this method superior to any other treatment he has used in chronic rheumatism.

In the administration of this treatment, care should be taken that the patient's stomach is empty, so as to ward off vomiting. When the joints are very painful, it is well to give a hypodermic injection of morphine, so as to relieve the pain incident to the involuntary movements of the joints during the chill. During the chill the patient is well covered with blankets. He should be kept in bed for several days after the symptoms have subsided.

[The Editor has used the prolonged electric light bath in a number of cases of arthritis, in some of which the treatment was pushed to the production of elevation of temperature (up to 105° F.) ; and he has the impression that identical results to those reported above can be obtained in this manner. His series is not sufficiently large as yet to publish definite results. It is probable, however, that while more troublesome, the induction of fever by means of the electric light bath will be found a much safer procedure.—ED.]

It may be of interest to note, in this connection, that fever may also be produced by certain non-protein bodies, for example, B-tetrahydronaphthylamin and some of its derivatives, and that, according to Cloetta[6] rabbits react constantly and regularly to intravenous injection of this substance. He finds that neither fatigue of the heat center nor habituation to this substance is produced by daily injections of the same dose for as long as two months. With bacterial toxins, on the other hand, progressive increase of dosage is necessary, owing to the development of antibodies.

Heliotherapy. Exposure to the sun's rays can probably be classified under this heading, as may be gathered from such reports as the following:

That sun baths are a potent remedy in bone and joint tuberculosis is the belief of A. H. Freiberg,[7] who reports speedy improvement in three otherwise practically hope-

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(6) Corr.-Bl. f. Schweiz. Aerzte, June 16, 1917.
(7) Amer. Jour. Orthop.-Surg., September, 1915.

less cases. The patients were treated by systematically and gradually accustoming the body surface to the sun's rays, until the entire surface was exposed for the greater part of the day, as recommended by Rollier. This, together with recumbency and the mere posturing the limbs in the most advantageous position and dietetic regulation, was all the treatment they received. Hence the improvement that resulted can be fairly ascribed to the sun baths. These patients had not improved under previous treatment, and retrogressed when the treatment had to be abandoned on account of the weather. So-called Alpine sun treatment failed to give the same results.

The problem is the construction of shelters, so that such patients may be given sun baths in winter as well as in summer.

Finsen Light Baths Did Not Produce Pronounced Results in Pulmonary Tuberculosis. This is the conclusion of V. Schmidt,[8] who reports on the treatment of thirty patients by means of carbon arc lights, so arranged as to give the nearest approach to the chemical action of the sun, to which the patients were exposed for an average total of about 500 hours at a distance of about 30 inches. While the patients rather enjoyed the treatment, no effect on fever, night sweats, expectoration or tubercle bacilli in the sputum was apparent. It is evident, he believes, that much longer courses are necessary for decisive results.

Artificial Heliotherapy in Lupus and Surgical Tuberculosis. Good results have been obtained by A. Reyn and N. P. Ernst[8] in several hundred cases of lupus and surgical tuberculosis treated with generalized exposures to the arc light during the past four years. They claim greater penetration for the rays of the arc lamp than for those given off by the quartz lamp. The entire body was exposed for from one-fourth hour to two and a half hours at a time. Treatments were given usually every other day, and kept up for from four to eight months. Nearly all were adult out-patients, living at home, so that the results can be ascribed to the effect of the light

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(8) Ugeskr. f. Læger., Jan. 18, 1917.
(8) Hospitalstidende, 1917, Vol. 60, p. 473.

rather than to hygienic measures. The authors believe that this is also true of the Rollier mountain treatment. Fourteen different classes of cases were treated. Especially good results were obtained in tuberculous fistulas and in bone and joint cases.

Desensitization. The study of hypersusceptibility, or anaphylaxis, is not only of importance from the standpoint of serum therapy, but also for the prevention and treatment of certain diseases in which hypersusceptibility is the obvious predisposing cause, *e. g.* in hay fever, asthma, urticaria and eczema.

The prevention of serum disease is discussed by S. Wyard,[9] most especially because of the fact that every man wounded in battle is given a single prophylactic dose of tetanus antitoxin. When, therefore, it is later deemed desirable to give further prophylactic doses or, symptoms of tetanus being manifest, larger therapeutic doses, it is necessary to decide as to the possibility of anaphylaxis following and either trust to luck that no ill-effects are produced or take anti-anaphylactic measures. He concludes that, until proof to the contrary is forthcoming, it must be assumed that anyone who received one or more injections more than 14 days previously is in this state; though, in case of the small doses (3 to 5 ml.) of tetanus antitoxin used in prophylaxis, it usually takes six weeks before hypersusceptibility appears.

The procedure Wyard recommends depends upon the induction of a temporary negative phase by the preliminary injection of a dose of serum smaller than that which will elicit anaphylactic phenomena. [The Besredka principle.—Ed.] By such a dose the individual may be rendered refractory for a time, during which further and even large doses may be given with safety. "In man sensitization rarely if ever reaches such intensity as to cause reaction with 1 ml. of blood serum, so that in the use of diphtheria or tetanus antitoxin, if it be considered unsafe to inject a large dose at once, 0.5 to 1.0 ml. may be used as a preliminary injection, followed five or six hours later by any further dose that may be considered necessary. Should even greater rapidity be

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(9) Lancet, Jan. 20, 1917.

desirable, such a preliminary dose may be followed in five or ten minutes by a larger, and every five minutes or so afterwards by steadily increasing amounts whereby in a very short time enormous doses may be given and without risk of anaphylactic shock."

When haste is not required, from 5 to 10 ml. of the antigen may be injected into the rectum, this having first been thoroughly cleaned out, and it will be found that the individual is rendered refractory from 10 to 12 hours later, so that further subcutaneous injections may be carried out with impunity. The slow absorption by this route evidently renders the larger dose mentioned equivalent in its effect to the smaller dose given subcutaneously in the previously discussed methods.

This practice rests upon the assumed identity of the anaphylactic to the immunity reaction, *i. e.* that it is a true antigen-antibody reaction. "Thus in a normal animal, antibody, if it exists at all, is present only in very small amount. A single dose of antigen, producing first a negative phase, subsequently calls forth a larger amount of antibody than in the untreated animal. These two processes explain the latent, or incubation period, during which no sensitization is found. At the end of that period antibody is present in such amount that a second injection of antigen is almost at once subjected to lysis with the production of anaphylotoxin as *in vitro;* but in cases in which by repeated injections immunity has been conferred the lysis proceeds even more rapidly than above, with the result that the toxic stage of proteolysis is so rapidly passed and the non-toxic stage reached that there is never sufficient toxin in the blood at any time to cause symptoms."

[A new theory and new names for anaphylaxis have been proposed by Novy and De Kruif, as will be seen from the discussion given below. It may be pointed out, however, that specific anaphylaxis is admitted by these investigators to be a specific reaction between antigen and antibody, in other words that the theory given above and the practice resting upon it is by no means disturbed.—ED.]

The Use of Alkali in Anaphylaxis, or "Taraxy," as they propose it be called, is recommended by Novy and De Kruif[1] on the basis of experiments, which show that alkali not only destroys the poison, but that also the formation of the poison in the test tube is prevented by alkali. The poison, formerly called anaphylatoxin, for which they propose the term, "taraxin," is developed by change from a non-toxic matrix in the serum that might be called "taraxigen." The terms proposed are derived from the Greek "*táraxis,*" a disturbance; and modelled after the terms; fibrin and fibringen, to denote similar relations. The transformation of the harmless matrix into poison is readily effected by the addition of almost any alien substance to serum. Thus, bacteria, trypanosomes, organ cells and organ extracts, peptone, agar, starch, inulin, kaolin, silicic acid, barium sulphate, diverse salts, and even distilled water act as inducers or accelerators of this action, which occurs even on keeping of blood in a syringe for a few minutes and injecting before coagulation has taken place, and which accompanies coagulation as well, so that blood serum is always more or less toxic. Foreign substances merely increase the rapidity of formation and the amount of the poison. In specific anaphylaxis, the inducing substance is formed by the specific reaction between antigen and its antibody, while the poison formed is the same as that produced by non-specific inducing agents. The authors advocate, in the treatment of chronic anaphylaxis (or taraxy), the administration of sodium bicarbonate, or preferably sodium acetate, in doses of from 3 to 5 gm., dissolved in about half a glass of water, and given at intervals of from half an hour to an hour during the day. The immediate object of this treatment is to raise the alkalinity of the blood to a maximum level and to keep it there. They also advocate its trial as a prophylactic in patients with a tendency to eclampsia and to food poisoning. In cases of special susceptibility to unfavorable results from salvarsan or antitoxin injections, the authors advocate the administration of a large dose of alkali shortly before such treatment.

Immunization to Hay Fever. This requires, accord-

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(1) Jour. Amer. Med. Ass'n., May 26, 1917.

ing to W. Scheppegrell[2] recognition of the group of hay fever pollen to which the patient is exposed and sensitive. There are four principal groups of hay-fever pollens: the ragweeds (*Ambrosiaceae*), grasses (*Gramineae*), wormwoods (*Artemisias*), and chenopodiums (*Chenopodiaceae*). A patient sensitive to any one member of the group, will be found sensitive to the pollen of other members of the group. The skin reaction is a fair index of the susceptibility of the patient to pollen inhalation, as well as a convenient check for the effects of prophylactic injections. When the skin reaction disappears, which may occur after the fifth to the twentieth injection given at intervals of from 2 to 5 days, the treatment may be discontinued if the hay-fever season is far advanced, or the injections made at longer intervals if this is not the case. The extract is applied to the scarified skin, or preferably injected into (not under) the skin (intradermic). In most cases the treatment should be repeated the following season.

In patients who have not responded to the prophylactic treatment, autogenous vaccines should be used, making the culture not only from the nostrils, but also from the nasopharynx. Vaccine therapy is an excellent adjunct to the pollen therapy, and has given good results even when the pollen therapy has been omitted.

Calcium chloride has given encouraging results in patients who were unable to use the pollen treatment. Crystallized calcium chloride is given in doses of 1 gm. in water three times daily with meals. This treatment, as in the pollen therapy, should be commenced at least six to eight weeks before the hay-fever season commences. It may be used when the nature of the patient's susceptibility is not known.

[It is interesting to compare this treatment with the most recent method of treating asthma, a typical exposition of which follows.—ED.]

Immunization Therapy in Bronchial Asthma. According to I. C. Walker[3] bronchial asthmatics may be

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(2) Interstate Med. Jour., 1917, p. 488; an early article on this subject, by Scheppegrell is abstracted in Practical Medicine Series, 1917, Vol. III, pp. 283-284.

(3) Jour. Amer. Med. Ass'n., Aug. 4, 1917.

divided into two groups: the sensitive and the non-sensitive.

The sensitive patients have the onset of their asthma early in life, chronic bronchitis is not a usual complication, and cardiorenal disease is rare in them. The prognosis in these cases is good. The non-sensitive patients generally have their asthma after the age of 40, chronic bronchitis is almost always a complication or cause, and cardiorenal disease is frequently present. The treatment of these patients is disappointing.

The sensitive patients will generally be found to respond, with a positive skin reaction to one of the following kinds of protein: horse dandruff, *Staphylococcus pyogenes aureus,* wheat, the pollens, *Staphylococcus pyogenes albus,* cat-hair and a few very common foods; these substances having been mentioned in descending order of frequency with which they have been found responsible for asthma. The skin test is carried out as follows:

"A number of small cuts, each about an eighth of an inch long, are made on the flexor surfaces of the forearm. These cuts are made with a sharp scalpel, but are not deep enough to draw blood, although they do penetrate the skin. On each cut is placed a protein and to it is added a drop of tenth-normal sodium hydroxide solution to dissolve the protein and to permit of its rapid absorption. At the end of a half hour the proteins are washed off and the reactions are noted, always comparing the inoculated cuts with normal controls on which no protein was placed. A positive reaction consists of a raised white elevation or urticarial wheel surrounding the cut. The smallest reaction that we call positive must measure 0.5 cm. in diameter. All larger reactions are noted by a series of plus marks and any smaller reaction is called doubtful."

Asthmatics sensitive to the proteins in horse dandruff or cat-hair are relieved of attacks during a series of subcutaneous injections with these proteins. Treatment is begun with the dilution of the protein next higher than that to which the patient reacts; thus treatment may be begun with a dilution of 1:100,000. The amounts of the dilution must be slowly and gradually increased with each treatment in order not to precipitate an attack of asthma.

Those patients who are sensitive to bacterial proteins are successfully treated with stock vaccines of that particular organism to which they are sensitive. Beginning with 200 million the first dose, the amount is gradually increased with the successive injections given at weekly intervals. Walker warns against using large doses of vaccine at first, or against sudden large increase of dose. In this connection it may be of interest to note that M. H. Sicard[3] finds autogenous vaccines from sputa containing *Streptococcus viridans* or *Streptococcus hemolyticus* curative, when given in dosage large enough to give local reactions twice a week in constantly increasing strength, for twelve to twenty injections. He begins with 100,000,000 in adults and feels his way cautiously until he finds a dose that causes a local reaction, and then he provokes a local reaction at every injection. He carries the dose up to 1,000 million, even 2,000 or 3,000 million and higher. He has had cases that showed no improvement until a dose was given large enough to cause local reaction.

If the patient is sensitive to food proteins, Walker finds that "omission of these foods from the diet is followed by relief from bronchial asthma, unless the patient has considerable bronchitis, which may require attention, and we find that vaccines made from the predominating organism in the patient's sputum greatly benefits or relieves his condition." Subcutaneous injections of food proteins have not given satisfactory results.

"Treatment with all these proteins that have been mentioned reduces the positiveness of the skin test and sufficient treatment renders the skin test negative to these proteins. Treatment with one protein desensitizes against all closely related proteins, . . . but treatment with a protein does not desensitize against other proteins that are not closely related; treatment with horse dandruff protein does not desensitize against cat hair protein, and treatment with the wheat proteins does not desensitize against the protein found in other cereals. . . . Those who are sensitive to several types

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(3) Amer. Jour. Med. Sci., June, 1917.

of protein are the most difficult to treat. This is because at first one can not judge which protein is the cause of asthma at the present time and so several proteins may have to be tried before the correct one is used.''

In the treatment of nonsensitive patients, bacterial vaccines have occasionally been successful. In many it has failed however. It is in some of these that potassium iodide has given more or less relief.

ORGANOTHERAPY.

Corpus Luteum in the Nausea and Vomiting of Pregnancy. J. C. Hirst[4] adds one more remedy to the legion of agents already recommended for the treatment of the nausea of pregnancy; and, if his experience is confirmed by others, corpus luteum is easily the best of all remedies in this often-times baffling ailment. He reports thirty-two successful cases among thirty-six cases studied. Not only was the nausea relieved, but the nervous phenomena of many patients were markedly improved. Not one patient aborted.

Hirst was led to try this treatment by the assumption that the nausea of pregnancy was due to non-absorption of corpus luteum during the first three months of gestation, during which time the corpus luteum constantly increases in size. From the third month on, the corpus luteum is gradually absorbed, and with this the nausea ceases. The non-pregnant sexually-mature woman is constantly absorbing corpus luteum; for no sooner is the corpus luteum of one menstruation disposed of, than another appears to take its place.

The remedy used was obtained in ampules, containing $\frac{1}{3}$ grain of soluble corpus luteum powder in 16 minims of physiologic saline solution. One dose every other day for five or six doses sufficed in mild cases. In severer cases, one dose had to be given daily for from twelve to fifteen doses. In pernicious cases, Hirst gave one ampule twice daily; and he would not hesitate to give two or three at a time in severe cases in which a decision as to the value of the method must be reached without

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(4) Jour. Amer. Med. Ass'n., Dec. 16, 1916.

delay. The largest number of doses required was forty-two. The average number was eleven.

The technique of administration is as follows: "The site of the injection, preferably the deltoid region, is prepared by cleansing with tincture of green soap and alcohol. The syringe used is glass, and it and the needle are boiled, and allowed to cool before the extract is drawn up from the ampule. *Alcohol is not a safe antiseptic to prepare a syringe for injection of any animal extract.* The site of the injection is gently massaged for a minute or two after the needle is withdrawn. All injections are given deep, into the muscle, and never subcutaneously."

[The same directions might be given regarding the administration of most other organ extracts.—ED.]

Ovarian Stroma Rather Than Corpus Luteum Should be Used Therapeutically. This is the dissenting opinion of W. P. Graves,[5] who finds that, in treating the vasomotor symptoms following hysterectomy, corpus luteum showed a great variation in effectiveness, often being entirely valueless, and occasionally producing digestive disturbances. In a series of nineteen cases, all but two patients showed toxic symptoms of a digestive nature, nausea and vomiting following one or two doses. These observations suggest to the author the possibility that the nausea and vomiting of pregnancy may be determined by the toxic effects of the internal secretion of the gestative corpus luteum.

[What about the alleged therapeutic results of J. C. Hirst (given in preceding abstract) in the nausea and vomiting of pregnancy? Is this an instance of homeopathic therapy? The theories of these two observers are certainly incompatible with each other.—ED.]

"On the other hand, the whole ovary, used in a large number of cases, showed great constancy in therapeutic effect, so that we have come to regard it as almost a specific in the ablation symptoms, both of the artificial and natural menopause. Striking results have also been obtained in the treatment of functional amenorrhea, and in the circulatory disturbances of the external genitals, such as kraurosis and the discomforts of senile atrophy.

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[5] Jour. Amer. Med. Ass'n., Sept. 1, 1917.

"Preparations made from the ovaries of pregnant animals, with the exclusion of the corpora lutea, proved superior therapeutically to preparations of the whole ovary from non-pregnant animals that included the corpus luteum. The superiority of the follicular products of pregnancy is explained by the fact that during pregnancy follicle atresia is especially marked, and is accompanied by a corresponding increase in the activity of the interstitial cells."

[Another proof, if such were needed, of how doctors disagree.—Ed.]

Antidiuretic Action of Pituitary Gland. Text-books on pharmacology, even the most recent ones, such as Sollmann's excellent manual (1917), give one the impression that pituitary extract has a diuretic action, though Sollmann says: "The evidence is inconclusive." It appears that these results are due to errors introduced by operative technique and short period of observation. K. Motzfeldt[6] using intact rabbits found that, even in normal rabbits, a definite decrease in urinary secretion occurs on subcutaneous injection of commercial preparations of hypophysis. The results were most striking, when an artificial polyuria was induced by the previous administration of from 150 to 200 ml. of water, in which case there was a marked diminution in the flow of urine, whether pituitrin was given orally, subcutaneously or intravenously. The cause of the effect is vasoconstriction of the renal arteries. It is a very interesting and therapeutically important fact that the diuresis following the ingestion of salt solution was not influenced by pituitrin. Hence a salt-poor diet would be likely to be an important adjunct to the administration of hypophysis in diabetes insipidus.

The same author (Motzfeldt) reported, as was announced in the 1916 Year Book, the successful use of hypophysis in three cases of diabetes insipidus in the human. To this may be added the carefully studied case

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(6) Jour. Exp. Med., January, 1917.

reported by Hans Bab,[7] a case of J. L. Miller[8] and the case of C. D. Christie and G. N. Stewart.[9]

The dose generally used was 1 ml. of pituitrin given subcutaneously. The results were prompt and marked, proportionate to the dose, unfortunately however they disappeared on cessation of the treatment. Subcutaneous injections only were efficacious. Oral administration was useless. Preparations of other internal organs did not have this effect. Hypophysis injections have increased in every case tested, the molecular concentration and specific gravity of the urine in normal persons and in patients suffering from a variety of diseases. We must therefore look upon the posterior lobe of the pituitary gland as the chief regulating center for diuresis and concentration of the urine.

Antidiuretic Action of Ergot. This action was also obtained by Motzfeldt[1] in his experiments on rabbits, not only by a preparation of the drug itself but also by two of its active principles, namely histamine (B-imidazolylethylamine and tyamine (parahydroxyphenylethylamine). [Inasmuch as ergot has been used in diabetes insipidus on empirical grounds, it is interesting to obtain experimental confirmation of this action. —ED.]

ALKALIES.

To comprehend the modern viewpoint regarding the effects of acids and of alkalies upon the system, it is necessary to remember that the reaction of the tissues and of the fluids of the body is very near the neutral point, inclining but very slightly toward alkalinity, and that, even in extreme degree of acidosis, though there is a diminution in the "alkali reserve," the reaction is practically unchanged. This is due to a wonderfully efficient regulating mechanism in the body by means of which the normal reaction is maintained. This mechanism may be considered to consist of: (1) The elimination of carbon dioxide from the lungs; (2) the

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(7) Münch. med. Woch., November and December, 1916, vol. 63, pp. 1685 and 1721.

(8) Amer. Jour. Med. Sci., October, 1916.

(9) Archiv. Int. Med., July, 1917.

(1) Loc. cit.

excretion of acid salts by the kidneys and the sweat glands; (3) the production of ammonia at the expense of urea; (4) the presence of so-called "buffer" substances in the blood, namely carbonates, phosphates and protein, which have aptly been termed our "three lines of defense," for by means of these three classes of substances the blood is endowed with a high degree of neutralizing power.

The last named portion of this mechanism is described by B. N. DeNiord[2] as follows: "As the first line of defense we have the carbonates. The carbonic acid formed by the combination of acid and carbonates is excreted chiefly by the lungs as carbon dioxide. If then more acid were liberated in the body and the respiration remained the same, we would have an increased carbon dioxide tension in the alveoli of the lungs with a correspondingly increased tension in the blood and tissues. This, however, is not the case because the respirations are increased in frequency and occasionally in depth. This increase is due to the stimulation of the respiratory center by the presence of acid radicles or the so-called H-ions in the blood, and is not due to carbon dioxide in the blood, as has long been taught . . . For this reason we find that, with an increase in acid radicle or H-ion, there is also a diminished carbon dioxide alveolar tension, depending on the degree of acidosis, or the retention of acid radicles present. With these findings one can likewise find that the carbon dioxide capacity of the plasma is also reduced in proportion." To understand this it should be remembered that the basic substances in the blood perform two functions: They enter into combination with carbon dioxide and they neutralize other acids. If excessive amounts of other acids are present, requiring an unusually large proportion of the basic substances of the blood for neutralization, then less remains available for combination with carbon dioxide. Hence the extent to which the plasma is capable of combining with carbon dioxide may be used as a measure of the acid bodies in the blood. A low carbon dioxide combining power denotes a tendency toward acidosis or the actual existence of one.

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(2) Buffalo Med. Jour., February, 1917.

In an average normal individual, 100 ml. of plasma combines with 65 to 55 ml. of carbon dioxide. Experience indicates that a lower value than 30 ml. must be reached before there is serious distress from the acidosis itself. Very low values are encountered in cases of diabetic and uremic coma. If such a person is given carbonates, they will be retained by the depleted and hungry tissues. The fact has been well brought out by Sellards (1912) in the so-called *alkali tolerance test,* which is carried out by giving orally, between meals, 5 gm. of sodium bicarbonate in water every two hours until the urine becomes alkaline to litmus. Normally this occurs with the first or at most with the second dose; in acidosis this tolerance is naturally raised. In such cases enormous amounts of sodium bicarbonate may be ingested with little or no effect upon the urinary acidity. That, however, the sodium bicarbonate produces an effect under these circumstances, that it actually increases the capacity of the plasma for combining with carbon dioxide is a well-known fact. Thus W. H. Morriss[3] reports a case of obscure toxemia of pregnancy, at the ninth month, associated with persistent vomiting and a marked acidosis, in which the carbon dioxide combining power of the plasma was increased from 26 to 62 volume per cent.; and, in another case, probably of Weil's disease, it was increased fom 20 to 80 volume per cent. following the administration of sodium bicarbonate.

"Let us consider the next line of defense, the phosphates," says DeNiord.[4] "These may combine with the acid radicles and thus form acid salts. These salts are excreted by the kidneys, together with the sulphates and chlorides. In this respect the kidneys have a remarkable selective action of being able to excrete the acid portion of these salts and retain varying amounts of basic elements. This being the case, when any damage to the kidney exists one of two things may happen. On the one hand we have the inability of the kidney to excrete the normally produced acids, in this way causing a retention of H-ions; or we may have a kidney

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(3) Jour. Amer. Med. Ass'n., May 12, 1917.

(4) Loc. cit.

in which the selective action of splitting off acid radicles and retaining some of the basic elements is lost, thus tending to deprive the tissues of basic material.'' In either case acidosis results. Fischer believes it is this which leads to imbibition of water by the cells, and to the production of edema and that it is even responsible for the swelling of the kidney cells.

Sodium Bicarbonate is the Best of the Alkalies for Relieving Gastric Pain is the chief message of a series of articles on ''Sodium Bicarbonate in Gastro-Intestinal Disorders,'' by L. T. de M. Sayous.[5] Hence [but even more because of its value in acidosis—Ed.], it is properly included by Huchard and Fiessinger in their small therapeutic handbook ''La therapeutique en Vingt Medicaments'' in which twenty drugs are selected that are to do service in the whole domain of internal diseases requiring medicinal treatment. The promptness with which it produces this effect and the fact that it is far more efficient than magnesium oxide or prepared chalk is ascribed to the liberation of carbon dioxide in the stomach, which not only has a direct sedative effect upon the stomach but also, by stimulating gastric peristalsis, hastens the passage of irritating material into the intestine. That the neutralization of acid, in itself, is not the manner in which ''baking soda'' relieves gastric pain is rendered evident when we realize that, according to modern researches, gastric pain is not directly due to hyperacidity. Furthermore, it has been noticed that in many instances gastric pain is most severe when the hydrochloric acid in the stomach is at a minimum, and that such pain is nevertheless easily relieved by the alkali. Based upon this theory is the suggestion of Meunier to administer, in cases in which there is but little hydrochloric acid in the stomach, a dose of tartaric acid with the sodium bicarbonate, instead of depending upon the gastric acid for liberation of the carbon dioxide. One effect, however, that is certainly due to excessive gastric acidity is pylorospasm and consequent delay in the evacuation of the stomach—a condition which sodium bicarbonate, admin-

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(5) New York Med. Jour., 1917, pp. 35, 128, 178 and 225.

istered at a suitable time, will relieve. While hydrochloric acid applied in normal degree of concentration to the gastric side of the pyloric sphincter causes its relaxation, and the neutralizing effect of sodium bicarbonate would produce a delay in evacuation of such a stomach, there is no doubt that the pylorospasm of hyperacidity is relieved by sodium bicarbonate.

One of the disadvantages of sodium bicarbonate is its power of arresting peptic activity, if large enough doses are taken to completely neutralize gastric acidity. This is taken advantage of by Hamburger for the treatment of gastric ulcer, who advises complete and continuous neutralization of the gastric juice by adequate doses of alkali with the object of inhibiting peptic digestion, which "next to mechanical trauma is probably the chief factor in promoting gastric ulcer." Such procedure has, however, the disadvantage of interfering with the antiseptic function of the stomach, an objection which might be overcome by aseptic feeding or by the ingestion of antiseptics.

Magnesium oxide and prepared chalk are useful adjuncts to sodium bicarbonate, to prolong the neutraling effect. They should be chosen according to the influence it is desired to exert upon the bowel. If there is a tendency to diarrhea, the calcium compound should be preferred; if there is constipation, magnesium oxide is of advantage.

In some cases, the liberation of carbon dioxide produces distress. In these, some prescription like the following might be used:

℞

Sodium bicarbonate Bismuth subnitrate, of each	15.00 Gm.
Magnesium oxide	10.00 Gm.

M. and Label: One-half to one teaspoonful in water one to two hours after meals.

Where the coexisting constipation is not efficiently relieved by magnesia, rhubarb may be added to advantage.

Owing to the coexisting nervousness of these patients, Tyrode suggests the following combination:

℞

Sodium bicarbonate Heavy magnesium oxide, of each	6.00 Gm.
Atropine sulphate	0.006 Gm.
Potassium bromide	15.00 Gm.

Mix and divide into 30 cachets.

Label: Take two cachets, each soaked in a tablespoonful of water, followed by a glass of milk, three times daily after meals.

While the chief indication for sodium bicarbonate is found in hyperacid states of the stomach, the following exceptions should be noted: Acute ulcerations with hematemesis or intestinal hemorrhages, some cases of cancer, and hyperacidity with hypermotility.

Owing to the marked relief afforded by sodium bicarbonate in many gastric conditions, which are frequently of obstinate nature, the question arises: is the continuous use of alkalies liable to produce unfavorable results. This may be answered in the negative for the doses employed therapeutically. The most disagreeable feature is that many patients have to increase the dose progressively in order to obtain relief. In such cases it is well to discard alkalies in the treatment of digestive pain, substituting bismuth subnitrate in large doses on an empty stomach every morning—except temporarily in attacks of violent pain, in which morphine would be required if sodium bicarbonate were not administered.

"In obstinate cases treated by other procedures without result, systematic Karlsbad medication in the intervals between exacerbations led to progressive attenuation and final cessation of the paroxysms." The artificial salt may be given, one teaspoonful in half pint of water at 90 to 120° F., one hour before breakfast.

Sodium Bicarbonate Increases Antisepticity of Bile is the claim of H. J. Nichols.[6] See also this series, Vol. VI, 1917, p. 61. The author states that the antiseptic action of the bile is largely due to its alkalinity, as this action disappears on neutralization. This finding suggested that alkaline treatment might be of value in the treatment of carriers of typhoid, cholera or dysentery bacilli, as the reaction of the bile can be influenced by the administration of alkali. In point of fact, this

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(6) Jour. Amer. Med. Ass'n., Jan. 31, 1917.

result occurred in two early carriers, whose duodenal contents became negative after a course of sodium bicarbonate, two grams three times daily for ten days.

[The reputation of alkaline saline waters, such as Karlsbad water, in cholelithiasis might possibly rest upon this increase in antisepticity of the bile.—Ed.]

Alkali Therapy of Diabetes has received a new impetus, owing to recent animal experiments, such as those of J. R. Murlin and J. E. Sweet[7] of clinical studies, such as those of Murlin and Craver and of F. P. Underhill.[8] If a complete gastrectomy is performed in an animal rendered diabetic by pancreatectomy, little or no glycosuria is developed. The animals likewise do not exhibit the usual profound toxemia of a simple pancreatectomy. As it has also been shown that, after removal of the pancreas, alkali facilitates sugar combustion, the hypothesis is advanced that the reason for the diabetes following pancreatectomy lies in the absorption of the hydrochloric acid produced in the stomach and unneutralized by reason of absence of pancreatic secretion. The mechanism regulating the level of blood sugar is peculiarly sensitive to disturbances in the acid-base equilibrium of the body. Acid tends to increase the sugar content of the blood and to cause elimination of sugar; alkali, on the other hand, tends to reduce the blood sugar content. This hypothesis has been put to a test by Underhill in a severe case of diabetes, in which he found that the administration of sodium bicarbonate in progressively increased dose, up to 120 gm. per day, caused a gradual diminution in the sugar output until the urine became sugar free. When the alkali was decreased to 42 gm. per day, the urine still continued sugar free. Further reduction in the amount of alkali caused the appearance of sugar in the urine, and a progressive increase in the amount eliminated as that of the alkali was deceased, until when no alkali was ingested the patient excreted nearly 60 gm. of sugar per day. When alkali was again administered, the diet remaining unchanged, the sugar excretion fell rapidly to the zero mark. That the patient had a high degree of

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(7) Jour. Biolog. Chem., December, 1916.
(8) Jour. Amer. Med. Ass'n., Feb. 17, 1917.

acidosis may be seen from the fact that he required 49 gm. of sodium bicarbonate to bring his urine to near the point of neutrality, when in normal man at most 15 gm. of sodium bicarbonate are required to render the urine alkaline. In another patient, a mild case of diabetes, Underhill could demonstrate a much greater sugar tolerance, when the patient was given sodium bicarbonate, up to 50 gm. daily.

Underhill has this to say about the method of alkali administration: "Sodium bicarbonate dissolved in water is very likely to cause nausea and vomiting. If the alkali is dissolved in a little water and ordinary carbonated water is added, the mixture can be drunk with no bad effects. So far as can be discovered, the ingestion of large doses of sodium bicarbonate over a long period of time has caused no injury or untoward symptoms of any sort. In order to keep a stream of alkali entering the tissues more or less constantly, sodium bicarbonate is taken in seven equal doses at approximately equal periods during the waking hours. The urine secreted during the night remains alkaline." He also notes that the acidosis of the diabetic must tend to become aggravated by the customary diabetic dietary; for, while meats are acid-producing foods, fruit and vegetables usually yield an excess of base. "Those food stuffs which are richest in base-producing substances are forbidden to the diabetic individual because they contain relatively large quantities of carbohydrates. The conventional diabetic dietary, consisting largely of meats and other protein foods and fats, would therefore have a decided tendency to aggravate the condition of acidosis induced by the abnormal state."

[Indeed, it has been found that lessening the ingestion of fats in diabetes is one of the most efficient ways of diminishing acidosis.—Ed.]

Sodium carbonate, administered by duodenal tube, has been found decidedly capable of diminishing the sugar in blood and urine of human beings by J. R. Murlin and L. F. Craver.[1] Probably owing to conservative use, the urine was not rendered entirely sugar-free, at least not for a whole day; but it was in several

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(1) Jour. of Biolog. Chem., December, 1916.

instances very materially reduced. These observers believe that sodium bicarbonate, given in enormous doses, may do more harm than good; and they recommend sodium carbonate, administered intraduodenally in concentration up to 1 per cent. They warn, however, that if this administration is kept up too long there is a possibility of sloughing. Signs of this were seen in one case, though it was not very serious. They administered the sodium carbonate solution in quantities of 500 ml. at a temperature of 45° C. by means of the Einhorn tube from a Thermos flask used as a Mariotti bottle, by the visible drip method, consuming about one hour for the administration of the total quantity. Larger amounts of fluid were used, but proved too much for the bowel to hold, several loose stools resulting within a couple of hours. A gain in weight was noted during the period of the alkali administration (in one patient up to about 4 kg.), which held for about 4 or 5 days after the alkali was discontinued. Doubtless this increase represents water almost exclusively. The reduction in the quantity of blood sugar was however such as to prove conclusively that it was independent of any factor of dilution. If this is true, there is little reason to doubt that the alkali may, in man as in the dog, facilitate the actual oxidation of glucose. There was also a distinct clinical improvement in several of these patients during the course of the treatment.

The Value of Alkalies in Nephritis has been studied experimentally by K. Gotto.[2] Inasmuch as Opie (1915) has shown that animals kept upon a diet rich in meat were more susceptible to the toxic action of uranium nitrate than when upon a diet rich in carbohydrates, Gotto fed his dogs upon a constant diet of milk and dog biscuits with no meat. It was found that injections of uranium nitrate produced a diminution in the plasma carbon dioxide content, an increase in the blood urea and plasma chloride, and the appearance of casts and albumin in the urine, all of which changes were decidedly less marked in the animals that were given sodium bicarbonate by mouth. On necropsy, the nephritis of the

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(2) Jour. of Experimental Med., May, 1917.

carbonate dogs was found less severe than that of the controls.

To Prevent Anesthesia Acidosis, W. H. Morriss[3] advises that the routine estimation of the alkali reserve of the body be added to the other precautionary examinations, such as urinalysis, blood examination, and estimation of blood-pressure, employed prior to operations. This could very easily be done by observing the rate of respiration and employing Yandell Henderson's (1914) simple test for acidosis—the ability to hold the breath for the normal period of forty seconds. "If there is a suspicion that the alkali reserve is not what it should be, one of the clinical methods for estimating it should be employed. Probably the simplest and most widely applicable of these is the determination of the percentage of carbon dioxide in the alveolar air by Henderson's technique, or the determination of the alkali reserve of the blood by the Van Slyke or the Henderson apparatus. When either test indicates the need for additional alkali, sodium bicarbonate should be given until the urine becomes alkaline or neutral; and after operation its administration either by mouth or by rectum should be continued."

Methods of Alkali Administration. A. O. Gettler and E. Lindeman[4] call attention to the following difficulties of acidosis therapy: "When given by mouth, the alkali is often vomited, and if there is persistent vomiting, as is often the case, it can not be so administered advantageously. Given by rectum, it is irritating after prolonged use, and a catarrhal condition may follow, with the development of a complete mucous cast of the lower bowel, absorption thus being prevented. When given by hypodermoclysis, it is painful, and this procedure is often followed by subcutaneous hemorrhage. The intravenous method, while rapid, is not free from danger. Some of the sodium bicarbonate is converted into carbonate in solution. The presence of an excess of sodium carbonate may jell the blood, even though the administration be very slow."

Having made experimental observations upon the

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(3) Jour. Amer. Med. Ass'n., May 12, 1917.
(4) Jour. Amer. Med. Ass'n., Feb. 24, 1917.

blood alkalinity of three healthy young men, who were given 10 to 20 gm. of sodium bicarbonate every 2 hours for 8 doses, the authors arrive at the following conclusions: "The maximum blood alkalinity is obtained between twenty and forty minutes after administration of alkali, reaching the greatest height in about thirty minutes. It subsides quickly thereafter. In acidosis therapy with sodium bicarbonate, the alkali should be given in small doses at regular and very short intervals, rather than in large doses once or twice daily."

The authors used *blood, thus alkalinized, for transfusion* in a case of hyperemesis of pregnancy with emaciation and profound toxemia and acidosis, which did not subside after emptying of the uterus. The effect of this transfusion was almost miraculous, both clinically and as far as blood alkalinity was concerned, which latter was increased more than the direct addition of alkali amounted to, suggesting that an additional influence might have been exerted in the direction of diminishing the formation of acid bodies.

[This single case hardly seems to justify advancing this as a "New Method of Acidosis Therapy," as is done by the authors.—Ed.]

Duodenal infusion of sodium carbonate solution has been used, as previously noted, by Murlin and Craver (see p. 142) in the treatment of diabetes, with alleged good results. This method of administration af alkali is advocated by G. L. McWhorter[5] in the treatment of obstinate vomiting, most especially that occurring after operation. The small soft duodenal tube may be passed before, during or after operation. The introduction into the stomach may be effected by first passing the tube inside of a stomach tube and then withdrawing the latter. Inasmuch as injections into the duodenum of even moderate quantities of fluid at times cause distress, the drip method of infusion should be resorted to. The usual container and drip apparatus are therefore connected with the tube. See Plate III.

In this manner, fluid, alkali and food may be introduced drop by drop continuously for days at a time. A patient of McWhorter's, for instance, received in this

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(5) Jour. Amer. Med. Ass'n., May 12, 1917.

manner 2,450, 1,880 and 1,550 ml. respectively on three consecutive days. The solution used was 0.4 per cent. salt solution with 6 per cent. glucose and 4 gm. of sodium bicarbonate daily. To this an ounce of cream and the albumen of one egg were added twice daily. As soon as the tube is in the stomach, it may be used to wash this viscus. As soon as this was done, in the case mentioned, the vomiting stopped; and after several days the patient's condition was so much improved that the tube was withdawn.

OXYGEN.

Oxygen Inhalation, like many other remedies, has had its ups and downs in therapeutic favor. It is likely to become more popular again as the result of two recent articles on the subject, the one by J. S. Haldane[6] and the other by S. J. Meltzer.[7]

Haldane emphasizes the following more recent additions to our knowledge of the physiology of respiration which throw light upon the therapeutic use of oxygen. Changes in the amount of air breathed are, under ordinary circumstances, almost entirely dependent upon the amount, not of oxygen, but of CO_2 in the blood leaving the lungs, and consequently passing to the respiratory center. The CO_2 acting on the respiratory center by reason of a very minute decrease of alkalinity which it causes. Want of oxygen does not help to excite the breathing excepting to a very limited degree. If the breathing is greatly and persistently increased, some other cause is present than oxygen want.

When oxygen want is accompanied by inability of geting rid of CO_2, we have great hyperpnea (which means increase in the volume of air breathed per time unit), accompanied by marked rise in pulse rate, rise in arterial pressure, palpitation, as well as a great rise in venous blood-pressure, which latter phenomenon is indicated by distension of the lips, face, tongue, etc., with blue venous blood, distension of the superficial veins in the neck and chest and other signs of "acute cyanosis."

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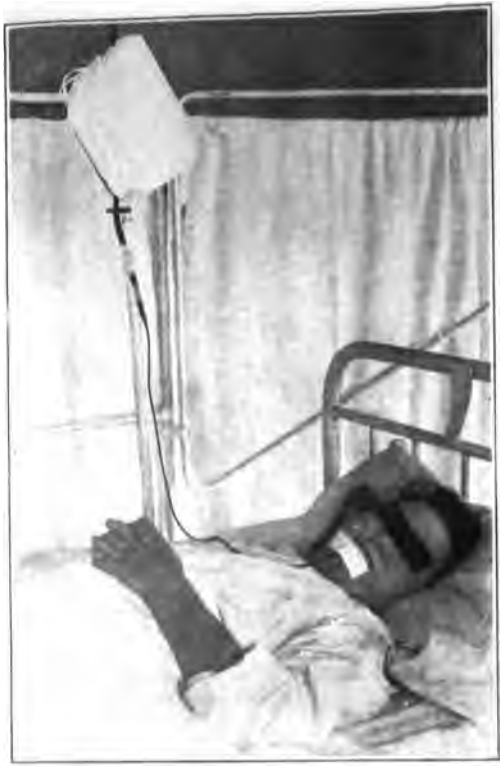
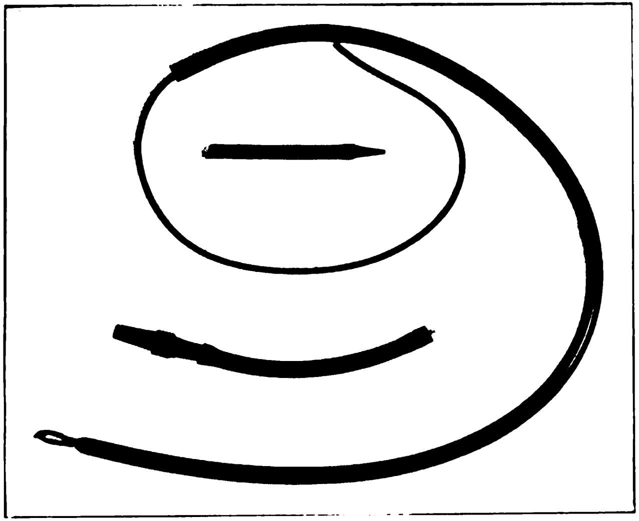
(6) Brit. Med. Jour., Feb. 10, 1917.
(7) Jour. Amer. Med. Ass'n., Oct. 6, 1917.

PLATE III.



Drip apparatus in action.



Duodenal tube placed inside of stomach tube to facilitate passage into stomach.—McWhorter (see page 145).

Inasmuch as the high venous pressure is liable to cause dilatation and subsequent paralysis of the heart, and death, *free venesection may be of the greatest service in acute cyanosis,* such as that arising from irritant gas poisoning.

If the washing out of CO_2 is not interfered with, "acute" cyanosis and hyperpnea do not occur at all, or are only temporary. The other effects of oxygen want then become prominent. The lips become leaden grey, rather than blue, since they are not distended with blood, and a progressive development of anesthesia takes place. If the oxygen want continues for hours, all the organs, but most especially the nervous system, suffer damage, which may lead to death, even though the exposure to the gas has been terminated and the poisonous gas been washed out of the blood hours and even days before. The damage done by oxygen want depends partly on the degree of oxygen want, but still more markedly on the duration of the exposure.

A slight degree of oxygen want continued for a considerable length of time, as in mountain sickness, produces headache, nausea and extreme depression, which latter most especially may make all the difference between life and death to a patient battling with severe illness.

Hence the physician ought to make every effort to avert the effects of want of oxygen or to cut them short.

While raising the oxygen percentage in the alveoli does not increase, under ordinary conditions, the amount of oxygen carried by the hemoglobin, it is possible to increase, by oxygen inhalation, the amount of oxygen in simple solution in the blood, from 0.25 ml. per 100 ml. of blood to about 2.5 ml. This is a considerable amount, when we realize that in passing around through the circulation during rest this blood loses only 4.5 ml. of oxygen. Furthermore, in poisoning with CO, nitrite, chlorate, or other poison which acts by disabling the hemoglobin, the increased percentage of oxygen in the alveoli obtainable by oxygen inhalation is more efficient in quickly restoring the oxyhemoglobin than is oxygen at the ordinary pressure.

In croupous pneumonia there is ordinarily no cyanosis, because the portion of the lung remaining healthy is amply sufficient to carry on the respiratory needs of the system during rest in bed. It must be borne in mind that the normal lungs and circulatory organs are adapted for meeting about ten times the respiratory requirements during rest, since the respiratory exchange is often about ten times as great during work as during rest. When cyanosis, due to a lung affection exists, in spite of the fact that air is entering the whole or a great part of the lung freely, we seem driven to the conclusion that the entry of oxygen into the blood through the alveolar walls is impeded by exudation and increase in thickness of the alveolar walls. This may occur without any serious impediment to the escape of CO_2, as this gas is about twenty-five times as soluble in water as is oxygen, hence passes through the alveolar walls far more easily, with a given partial pressure, than does oxygen. Moreover, a comparatively slight increase in breathing will enormously increase the small difference in diffusion pressure on which the passage of CO_2 outwards depends; but the same increase in breathing produces only a slight proportional increase in the diffusion pressure which drives oxygen inwards. Hence we may have cyanosis, and consequently very formidable effects from oxygen want, without marked hyperpnea. The grey look of the patient's face will be a good index of this. There will probably be no increase in venous blood-pressure with its accompanying full blue cyanosis.

If great hyperpnea accompanies cyanosis, there must be some other complicating conditions. This occurs, for instance, in the acute stage of poisoning with chlorine or with nitrous fumes. In this condition, the alveolar walls become extensively torn in efforts to breathe despite the blocking of many of the bronchi by exudation or constriction. In consequence of this there is widespread emphysema, which is very evident on necropsy. The areas around the emphysematous cavities are partially collapsed and very imperfectly ventilated; and, though the emphysematous cavities are excessively ventilated, this is of little value owing to the small proportion of sound alveolar wall exposed to the air. In consequence of this the CO_2 content of the arterial blood is raised, and hyperpnea, along with increased arterial and venous blood-pressure, results. As the edema clears up the cyanosis disappears, but the hyperpnea remains for days, since it takes a considerable amount of time for the emphysema to heal up.

"When there is cyanosis (whether of the deep purple or grey type), due to hindered passage of oxygen through the alveolar walls, this can be combated by raising the percentage of oxygen in the alveolar air and so increasing the diffusion pressure. The normal alveolar oxygen pressure is about 14, or 7 per cent. less than in the external air. By raising the percentage of oxygen in the inspired air to 35 we raise the alveolar oxygen percentage to 28, and thus much more than double the effective diffusion pressure, since the oxygen pressure in the venous blood passing to the lungs will be at least 4 per cent. It will probably, therefore, require only a moderate increase in the oxygen percentage of the inspired air to remove the cyanosis. Even in ordinary cases of croupous pneumonia the alveolar oxygen pressure may be a matter of decisive importance. This can be clearly shown by the fact that these pneumonias do badly in high altitudes."

"In cases where the source of danger is failure of the circulation, the inhalation of oxygen may also be of use, and I have seen the cyanosis in a case of valvular disease clear up at once on the administration of oxygen. The effect was so striking that it could hardly be attributed to the increased amount of oxygen going into simple physical solution in the arterial blood. It seemed more probable that owing to back pressure in the lungs and consequent exudation, etc., there was hinderance to the diffusion of oxygen inwards, and that with the increased oxygen percentage this was overcome . . . *Cyanosis may always be taken as an indication that oxygen inhalation should be considered.*"

Where, in lung affections, an addition of oxygen to the inspired air is needed in order to combat want of oxygen, it is evidently desirable to continue the administration over long periods; and Haldane believes it is also desirable to keep the oxygen percentage as low as possible during long administrations, and to know roughly what perventage is being breathed, as according to Paul Bert and Lorrain Smith excessive administration of oxygen may produce damage. The immediate effect of suddenly giving an abundance of oxygen to a cyanosed person may sometimes be unpleasant; hence it is well to turn on the oxygen rather gradually. Haldane describes and pictures an apparatus, for which those interested are referred to the original communication, as the editor believes that Meltzer's method to be described herewith has advantage over that of Haldane.

Meltzer (l.c.), in discussing the physiologic aspects of the problem, refers to the observations of Hill, from which we learn that the addition of oxygen to the atmospheric air exerts a favorable influence under conditions of greater bodily activity, that inhalation of oxygen makes exertion, such, for instance, as running up and down stairs, easier, accomplished in a shorter time, relieves the feeling of dyspnea, and restores strikingly the vigor after fatigue. Meltzer believes that the reason physicians do not see much good from oxygen administration is that they give it too late and inefficiently, as well as wastefully. When oxygen is given in a weak current through a funnel held an inch or more from the mouth of the patient, one can hardly speak of "oxygen inhalation," as under these circumstances the air which the patient actually inhales is probably not more than 2 per cent. richer in oxygen. The funnel, on the other hand, may be instrumental in making the inspired air richer in carbon dioxide and surely makes the air over the face warmer, which produces an unpleasant sensation. Therefore, we often see the patient pushing the funnel away or turning the head away from it.

Meltzer's apparatus for the rhythmic insufflation of oxygen is described as follows: "The thick walled rubber tubing that is connected with an oxygen tank terminates in a strong rubber bag which, at its distal end, is connected with the proximal end of the respiratory valve, described in the Medical Record, New York, July 7, 1917. The distal end of the last-named device is connected by means of a short piece of rubber tubing with a flat metal tube, which we may designate as a "hollow tongue depressor." If the ring of the respiratory valve is kept in the inspiratory position (right side), when the oxygen is turned on, the gas streams through the tube into the bag and from there escapes through the respiratory valve and the tongue depressor. If the ring is kept in the expiratory position (left side) the oxygen can not pass through the respiratory valve, and accumulates within the bag."

"The tongue depressor should be inserted in the mouth not much farther than the middle of the tongue, so that, if the patient is conscious, the presence of the depressor may cause no gagging or other discomforts. The lips should be kept closed. The ring should be moved from left to right and from right to left (a cirspiratory cycle) about twelve times per minute. The oxygen should be turned on slowly, and the velocity of its escape should be controlled, so that it does not cause an overdistention of the bag during the expiratory pause. The turning of the ring to the right should be done slowly, so that the inspiration may develop gradually; the turning to the left is preferably done abruptly. The expiratory air escapes during the closure of the valve through the nose and through the aperture that appears above the closed valve when the ring occupies an expiratory position. It is advisable to time the inspiratory insufflations synchronously with the inspirations of the patient."

The insufflation, when carried on under moderate pressure, produces no unpleasant sensation whatever. Oxygen may be forced into the chest by this method, as in artificial respiration, and deeply anestetized cats may be kept alive by it, when the tongue depressor is inserted in the pharynx, and the oxygen kept from distending the alimentary canal by keeping the abdomen compressed. Even when the tongue depressor was inserted, as in the human being, not further than the middle of the tongue, moderate distention of the lungs could be produced in anestetized cats. However, when the tongue depressor was in that position, life could not be kept up indefinitely.

The assistance which this apparatus renders to inspiration ought to be of special value when the respiration of the patient is very shallow. The apparatus, on the other hand, does not offer any resistance to expiration, such as is offered when the oxygen is administered by means of a mask. To the conscious patient the face piece of Haldane's apparatus must be a great inconvenience.

"Four cases of pneumonia were treated by means of this method. In all of these the treatment was begun when the patient's condition was already very grave and apparently hopeless. In all cases the cyanosis improved soon after the insufflation was started. In one case the cyanosis returned immediately after the insufflation was stopped. There was apparently no storing capacity whatever for oxygen. That patient died one hour after the treatment was begun. In the second case, there was at the beginning a definite storing capacity for oxygen which, however, gradually disappeared. The life of the patient was then kept up for several hours by continually administering the (rhythmic) insufflation of oxygen. In a third case, the storing capacity was small, but remained unchanged for five hours. The patient died during a prolonged period when oxygen could not be readily procured. The fourth case, which practically was as hopeless as any of the foregoing, showed a definite reversion in the direction of recovery about two hours after the treatment by means of oral insufflation of oxygen was begun, and this patient recovered."

"It seems justifiable to assume that the period of definite cyanosis is preceded by a more or less long period during which the capacity for taking up oxygen and storing it, by the vital cells, are gradually getting impaired; and it is further justifiable to assume that during early pathologic periods the insufflation of oxygen may be capable of restoring these capacities to their normal extent more frequently and efficiently than during later stages. The early insufflation might thus be the means of preventing the disease from reaching the stage of cyanosis."

Meltzer recommends, therefore, that in pulmonary and cardiac disease oxygen should be administered by means of oral insufflation several times a day at an early period when there is not yet an urgent necessity for it. Oxygen should not be considered as a terminal measure.

Hypodermic Injections of Oxygen in Local Asphyxia. According to an editorial in the British Medical Journal of June 5, 1915 (p. 973), hypodermic injections of oxygen were used therapeutically for the first time in 1900 by Ewart and Domine, independently of each other. They have since then been used and advocated by numerous men for general action—to overcome oxygen deficiency in the system, as well as for local effect. While the Editor of this section is rather skeptic regarding the value of the former procedure, he desires to call attention most especially to the local uses that have been made of it. Ramond (1910, 1911) used this treatment successfully in two cases of Raynaud's local asphyxia, in which he found a few c.c. sufficient for marked results. Dumarest used it in early gangrene of the foot, due to arteritis and "frost bite," which occurred in large numbers during war. In 1914, Howitt furnished [perhaps rather scant—Ed.] experimental evidence of the protective value of oxygen injections in otherwise fatal tetanus infection of guinea pigs. Léger (1915) tried it with success in three cases of apparently hopeless tetanus in human beings.

The relation that certain forms of trench foot bears to Raynaud's disease led H. O. Smith[8] to try this treatment in edematous and gangrenous forms of this affection. The reasoning underlying this treatment is as follows. "The edema produces stasis in the veins of the foot, impeding or stopping circulation. The venous blood, if oxygenated, will help to keep the tissues alive until the serum can be drained away. The oxygen helps to drive out the serum slowly but steadily through the puncture holes. Mere puncturing has been found useless to relieve the edema. Furthermore, the oxygen balloons up the subcutaneous tissues, and relieves thereby pressure on the blood vessels and lymphatics. When the oxygen is absorbed and the serum drained away, circulation is quickly restored to the limb.

The pain is markedly relieved at once; and the red-

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(8) Brit. Med. Jour., April 21, 1917.

dish-blue appearance of the part changes to pink. Blackened areas become white, greyish-white or pink. Any living tissue is picked out in pink; while the white line indicates what would ultimately be the line of demarkation of the gangrene. By means of this treatment the destruction of parts is greatly lessened, and is often confined to the tips of the toes.

The technique of the treatment is as follows: "A Woulfe bottle is required with two glass tubes bent at an angle and inserted into a tightly fitting cork. To the end of one glass tube is fitted two yards of rubber tubing connected with the usual oxygen cylinder; to the end of the other glass tube is fitted two yards of finer rubber tubing, and the distal end of the tube has a salvarsan needle fitted on. The bottle contains a saturated solution of sodium carbonate.

It is best to sterilize the needle in boiling oil, and this should be done for each individual case. The operator, having sterilized his hands, uses a little iodine on the proposed sites of puncture. The needle is inserted into the subcutaneous tissue at a point midway between the heel and the external malleolus. The oxygen is allowed to enter slowly until the foot is filled up. The needle is then withdrawn and inserted midway between the internal malleolus and the heel. If the toes are

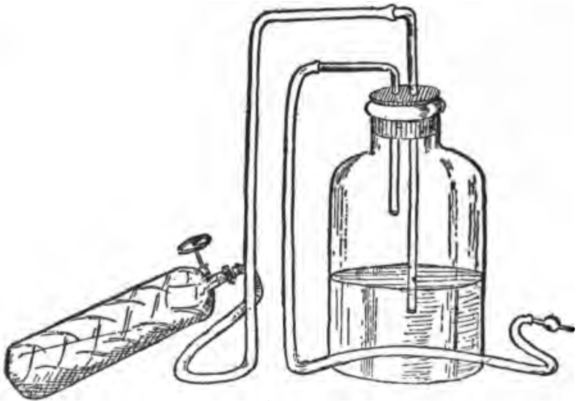

Fig. 6.

black and cold, the needle is inserted in the midline at the base of the toes. It is important that the oxygen should be injected slowly. If the part is almost gangrenous, injection into the deeper tissues is of advantage. Blisters should be drained by a sterilized thread passed through by means of a straight surgical needle and the ends cut short. The dead skin should be left in situ as a protective unless pus is present. Lint wrung out of 1 per cent. solution of picric acid is applied to the part and renewed every day. No cotton-wool should be applied or disastrous results will ensue. The lint and bed clothes next day will be found saturated with serum, sometimes clear, sometimes blood-stained. The skin will have a peculiar wrinkled appearance, . . . the foot is warm even at the toes, and movement will have returned. At the end of the second day tingling sensations are complained of. A second injection may be given in the severe cases which are semigangrenous and where the edema still persists . . . Picric acid should be used once or twice a day to keep the part dry and sweet . . . Repair is slow but sure, and many hopeless looking cases have recovered with useful limbs and small loss of structure."

Inasmuch as this method is simple, inexpensive, and free from risk, having never produced any bad effects, it deserves to be more generally known. It should be noted that it has never produced gas embolism either in man or in animals.

SYMPTOM THERAPY.

Aluminum Chloride as Anhydrotic. A. W. Stillians[1] recommends the use of a 25 per cent. solution of aluminum chloride ($Al\ Cl_3.\ 6\ H_2O$) for the treatment of excessive localized sweating, as of hands, feet, or axillae. The solution is dabbed on gently and allowed to dry, the application being repeated every second or third day for three applications; and then perhaps once a week to prevent recurrence. As the solution is somewhat irritant, care should always be taken to reduce any

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(1) Jour. Amer. Med. Ass'n., Dec. 30, 1916.

active inflammatory eruption before using aluminum chloride. Excessive or careless use followed by scratching may easily cause a dermatitis. Used with ordinary care, this solution has done wonders in the series of twenty cases in which Stillians used it. Further trials with this remedy seem desirable.

Expectorant Action of Ammonium Chloride. In view of the idea generally accepted by pharmacologists and physiologists that ammonium is rapidly converted into urea, most especially by the liver, a considerable degree of doubt has arisen as to the probability that ammonium chloride could influence expectoration. Hence it is of interest to note the finding of W. Coleman[2] that in seven cases the use of ammonium chloride in doses of from ½ to 5 grains every two hours distinctly increased the amount of ammonia nitrogen in the sputum. This, together with the fact experienced by himself that the use of the drug lessened the tenaciousness of the sputum and of the difficulty in its expectoration, causes Coleman to conclude that the reputation of ammonium as a valuable expectorant is well deserved. He finds that the action of the drug develops within one-half to one hour; and that the taste of ammonium chloride is unmistakably present in the sputum for from twelve to fifteen hours after the last dose. This he believes demonstrates a relatively slow excretion of ammonium chloride in man.

In this connection it might be of interest to note the observation of G. L. Wolf and E. Oesterberg,[3] who showed that, after taking 5 gm. of ammonium chloride, the ammonia nitrogen in the urine was considerably increased for two days, the curve reaching its highest point within two hours after the dose. Inasmuch as 52.5 per cent. of the ammonium ingested was eliminated by the kidney alone within two days, while the urea nitrogen was somewhat diminished, it is evident that little if any ammonium chloride is changed into urea, when a single large dose is taken.

[Further observations of this kind are desirable, especially with ordinary medicinal doses, to establish fully these important points.—ED.]

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(2) Amer. Jour. Med. Sci., October, 1916.
(3) Biochem. Zeitschr., 1912, Vol. 40, p. 234.

HEMOSTATICS.

Some Specific Hemostatics. [The hemostatics may be divided into two groups: those that precipitate protein in a non-specific manner, *e. g.* certain salts of heavy metals and tannin; and those that favor, in a specific manner, the production of fibrin. This distinction is of practical importance, since it is impossible to use the non-specific hemostatics in the treatment of inaccessible hemorrhage, as protein-precipitants cannot be introduced into the blood-stream, while the specific hemostatics increase the coagulability of the blood, when injected into the circulation, thus enabling us to treat, by means of them inaccessible as well as accessible hemorrhage. The hemostatics to be discussed here belong to this latter class. Inasmuch as their development is due to certain recent advances of our knowledge of the coagulation of the blood, brief reference might be made here to the most recent theory regarding this process.

The coagulation of blood is due to the formation of fibrin from fibrinogen. This change is produced by *thrombin,* formerly called fibrin ferment, which however does not seem to be a ferment at all. Thrombin is present in the blood in the form of *prothrombin,* from which thrombin is produced by union with calcium. This union is not permitted to occur in the circulating blood by a substance that has been called *antithrombin.* For blood clotting to take place, it is necessary that the antithrombin be neutralized by a material obtained from the disintegration of the tissue cells, including the blood cells, and most especially of the blood platelets. This material, which might best be called *thromboplastic substance,* has had various other names, such as zymoplastic substance, coagulin, cytozym, thrombokinase, applied to it. The substance may be extracted from tissues by the action of ether; and it has been shown to correspond in its properties to the chief lipoid of the brain, *kephalin.*[4]

The just-described mechanism has aptly been compared by Crile to an air-break on a street car, ever ready to stop the car, unless checked and kept from

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(4) For a detailed discussion of this theory, the reader is referred to Howell's Physiology, 5th Ed., 1914, p. 541.

action by the compressed air. The moment this inhibitive influence is removed, the break gets into action and stops the car. The clotting of blood is so important a protective mechanism against bleeding to death, that the blood is ever ready for clotting, unless kept from undergoing this change by the antithrombin. The moment an injury occurs, thromboplastic substance is liberated, the antithrombin thereby inactivated, and clotting takes place.

Use of Blood Serum as Hemostatic. The hemostatic value of injections of blood serum, either of man or of the horse, is well established by clinical experience. This effect of serum injections is evidently due to the presence of thromboplastic substance, or of thrombin, or both.—Ed.]

Serum or Blood as a Prophylactic Against Bleeding. This is advocated by P. E. Weil[5] whenever the clotting power of the blood is found to be diminished, which may be determined by means of M. Bloch's coagulometric technique, which is described in the article as well as briefly in the abstract. He advises the use of 20 to 40 ml. of normal human or animal serum, forty-eight hours before the operation, whenever the blood does not coagulate normally. He believes that, in familial hemophilia, injections of blood serum every two months for a year greatly improve the clotting power of the blood. In that type of hemorrhagic diathesis, in which the clotting time is not much increased, but there is no retraction of the clot, the subcutaneous injection of 20 or 30 ml. of human blood forty-eight hours before the operation is advised. When, however, the tests show excessive tendency to coagulation, serum injections should, of course, never be used; ether and chloroform avoided; and citric acid, from 12 to 18 gm. daily diluted in large amounts of water, or possibly sodium citrate be given to prevent thrombosis.

It may be of practical interest to note that *normal horse serum* is marketed by quite a number of firms (Mulford, Squibb, Slee, and others), generally in

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(5) Presse Méd., April 12, 1917; abstracted in Jour. Amer. Med. Ass'n., June 9, 1917.

syringes containing 10 ml. each, though 50 and 100 ml. packages are also obtainable.[6]

[However, the serum treatment of hemorrhage and of hemorrhagic diatheses by the injection of whole normal serum has the disadvantage that large amounts of inert and potentially harmful materials are injected with the substances that favor coagulation; there is, for instance, the danger of anaphylaxis. If human serum is used, to avoid this danger, there is unavoidable delay in its preparation, which might be fatal in emergencies. Finally, serum loses its coagulative property on keeping.—Ed.]

Use of Serum Fractions. These disadvantages have led to attempts to separate the serum into coagulative and non-coagulative fractions. Thus, A. F. Hess[7] succeeded in separating these fractions by means of ammonium chloride. He found that the fraction known as *euglobulin* is particularly powerful in accelerating the normal clotting process. Inasmuch as it does not act by counteracting antithrombin—in other words, is not a thromboplastic substance—it either must be thrombin or contain this material. The process described by Hess enabled him to prepare a hemostatic containing about 2 per cent. of protein, which is more potent as a coagulant than the whole serum containing 6 or 7 per cent. of protein.

Thromboplastic Substances. Coagulen Ciba,[8] originated in 1913 by A. Fonio at Kocher's clinic, hence generally known as "Coagulen, Kocher-Fonio," is "an extract said to be prepared from blood platelets and to contain thromboplastic substance, mixed with lactose, 1 gm. representing 20 gm. of dried blood." It is a yellowish granular powder, having a slight odor and a sweetish taste. It is very soluble in water. Some of the more recent results on its clinical use may be noted here:

Fonio[9] reports on a series of cases of hemorrhagic diathesis successfully treated by intravenous injection of coagulen. He claims this to be the easiest and simplest

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(6) New and Nonofficial Remedies, 1917, p. 278.
(7) Jour. Exp. Med., December, 1916.
(8) New and Nonofficial Remedies, 1917, p. 127.
(9) Deutsch. med. Wochenschr., 1916, vol. 43, p. 1344.

method of supplying the lacking blood platelets, when this seems to be the cause of the trouble, as in Werlhof's disease. In hemophilia, a single application may turn the scale and save the patient's life. Its use is contraindicated, when there is reason to suspect change in the vessel walls or other abnormal conditions in the blood-vessels favorable to thrombosis or embolism, as in certain stages of syphilis, arteriosclerosis, and in septic processes.

Coagulen is used in 5 to 10 per cent. solution, freshly prepared in physiologic saline, and boiled for three minutes, in order to sterilize it. It may be employed locally, hypodermically, intramuscularly or intravenously.

Fonio (1914) gives the following dosage for injections: In urgent cases, he advises the use of 50 to 75 ml. of 3.5 per cent. solution intravenously, and enough of this solution given subcutaneously to administer a total dose of 5 gm. In cases that are not urgent, 5 gm. of coagulen should be given subcutaneously, in low concentration, since injection in high concentration is painful. In constitutional disease, such as hemophilia, purpura, or scurvy, oral administration may be tried; and subcutaneous injection resorted to only in case of necessity.

Gastric Hemorrhage Treated by Coagulen. Bräutigam[1] reports a case of serious gastric hemorrhage treated successfully by the local application of a 10 per cent. solution of the blood platelet extract. Meyer[3] used coagulen in a case of hematemesis, which occurred six hours after a gastro-enterostomy. The patient drank the contents of a tube of coagulen, after which the vomiting and bleeding stopped at once and permanently. Meyer believes the coagulen would not have any effect if the stomach contained food, since the coagulen must come into direct contact with the bleeding surface. Therefore, it is best administered immediately after vomiting.

Kephalin[4] is obtainable in two forms:

1. *Brain Lipoid,* or impure kephalin, prepared ac-

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(1) Münch. med. Wochenschr., 1916, vol. 43, p. 1656.
(3) Münch. med. Wochenschr., 1916, vol. 43, p. 1823.
(4) New and Nonofficial Remedies, 1917, p. 124.

cording to Howell's method by extracting the brain of the ox or other mammal with ether, and evaporating the ether until a yellow fatty residue remains. For use, this material is either applied directly to the tissues or by means of tampons; or else an emulsion may be prepared by dropping 10 to 30 drops into an ounce of physiologic salt solution and then shaking it up.

2. *Solution Brain Extract* (Solution Thromboplastin, Hess), a suspension of brain tissue in physiologic saline, may be applied or sprayed directly to the bleeding surface, or by means of a tampon saturated with the liquid.

H. L. Cecil[5] used kephalin in packing for bleeding after surgical operations, and also employed kephalin-coated catheters in prostatic median bar excisions. The results were favorable. Cecil arrives at the conclusion that kephalin causes a quicker and firmer clot, and that not so much pressure is required in packing to control the hemorrhage, as when plain or iodoform gauze is used. When the packs are removed, the clot is of sufficient firmness to prevent further bleeding, which is not true of other packs.

In his latest report on thromboplastin solution, A. F. Hess[6] comes to the following conclusions regarding its clinical value: "Tissue juice made from brain (thromboplastin solution) has proved itself of practical value in controlling hemorrhage, wherever it can reach the site of the bleeding. In case of true hemophilia, it may be regarded almost as a specific hemostatic. It is to be recommended for local use in the bleeding of the newborn, in nasal hemorrhage, and in the parenchymatous bleeding associated with various operations, etc. Further clinical experience is needed, before its value as hemostatic for gastro-intestinal hemorrhage can be determined. However, it is innocuous when given by mouth in considerable dose and would therefore be indicated in bleeding from the stomach and upper intestine."

[It appears, therefore, that these substances should be given extensive and critical trial.—ED.]

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(5) Jour. Amer. Med. Ass'n., Feb. 24, 1917.
(6) Ibid., Dec. 9, 1916.

RELIEF OF PAIN AND ITCHING.

Permanent Nerve Blocking for Relief of Chronic Intractable Pain. In regard to relief of tic douloureux, G. W. Robinson[7] says:

"It is useless to undertake to relieve a patient of tic douloureux by the administration of drugs. All analgesics, if continued for any considerable period of time, are injurious to the general health of the patient and are habit-forming in character. Cutting operations are disfiguring, some of them are severe and serious in nature. None except removal of the Gasserian ganglion are assuredly permanent in their results. This operation is so very serious that it is rarely, if ever, justified. Injection of alcohol within the various divisions of the nerve or within the ganglion, if the technique be proper, can be made without disfiguring the patient, without shock and with little discomfort and the result will be an entire relief of the neuralgia for a period of twelve months or longer. If the neuralgia recurs after the reconstruction of the nerve, another injection can easily be made."

[The directions for the technique of injections can not be profitably abstracted here.—ED.]

Perineural Infiltration of Salt Solution in Sciatica. C. Rosenheck and H. Finkelstein[8] found these injections, practiced as advocated by D'Orsay Hecht, disappointing, most especially in sciatic neuritis. In acute cases of sciatica due to exposure the best results were obtained; but no better than by the old method of rest in bed, "ironing" or other local measures with administration of analgesics. Approximately only 20 per cent. of a series of fifty patients were cured or improved, as against 60 or 65 per cent. of those of other observers.

Relief of Various Chronic Pains. Nerve blocking has opened up a great field of usefulness, according to F. G. Dyas,[9] who says:

"This method of treatment must be reserved for those patients who have gone beyond the hope of other relief;

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(7) Illinois Med. Jour., June, 1917.
(8) Jour. Amer. Med. Ass'n., Dec. 30, 1916.
(9) Illinois Med. Jour., May, 1917.

as in recurrence of malignant tumors after operation. If it were possible, by the injection of alcohol around those nerve trunks which supply the painful area, to produce a localized analgesia, the necessity for the use of morphine would be obviated, and the unfortunate patient might be conducted to a peaceful end."

Thus alcohol injection of the brachial plexus might be used to relieve pain in the upper extremity. It would, of course, also produce a motor paralysis. The loss of motor power would, however, be negligible under such conditions. In carcinoma of the pelvic organs, blocking of the sacral plexus, and, for hopeless conditions of the upper abdomen, paravertebral injection of the intercostal nerves might be employed.

Nerve Blocking for the Relief of Intractable Itching. Alcohol injection for pruritus ani was advocated by H. B. Stone,[1] who is reported as saying:

"This method is frankly symptomatic treatment, but gives relief. It destroys the sensory filaments chemically, not surgically. We want to destroy the sensory but not the motor nerves. Alcohol has no selective affinity, and will destroy motor nerves as readily as the sensory nerves, and thereby produce incontinence. If injection is into the skin itself, it will produce a slough, but if into the subcutaneous fat it will not. In forty patients the results have been exceedingly satisfactory, more than from any other method. Under anesthesia, local or general, the needle is introduced through the skin and then along under the skin, but not too deep, or the motor nerve will be endangered. If a local anesthetic is used, 90 per cent. alcohol is injected; if a general anesthetic, 70 per cent.; nothing less than 70 per cent. is effective. We have had two bad sloughs the size of a ten-cent piece or silver quarter, and eight or ten as large as a grain of wheat with no incontinence. If one errs, it should be toward the slough. All patients were completely relieved; one case recurred in about a year, and the patient was re-injected. Patients should be kept under observation for ten days, to see if sloughing occurs. There is no trophic disturbance; the slough heals readily."

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(1) Jour. Amer. Med. Ass'n., Dec. 9, 1916.

Sacral Anesthesia for Genito-anal Pruritus. W. Holland[2] advocates temporary anesthetization of the region to break in on the vicious circle produced by the itching and scratching. He makes epidural injections of from 20 to 48 ml. of water, in which from 0.2 to 0.3 gm. of novocain is dissolved.

Local and Systemic Treatment of Itching. This is summarized by Kilroy[3] as follows: Diet, rest, salicylates, eliminants, things whose worth has been proved in gouty states, are effective in relieving itching. Probably pyramidon and sodium bromide should be put at the head of general antipruritic agents. The successful local applications are those that benumb; the ethyl chloride that causes local anesthesia will, in milder application, relieve itching; all cold benumbs, and hence the benefit of ethers, alcohols or menthols. Heat benumbs, too, and the antipruritic influence of very hot water is a matter of common knowledge.

STIMULANTS TO CIRCULATION.

Value of the Digitalis Group in Auricular Fibrillation. A. R. Cushny[4] discusses the manner in which digitalis produces its almost specific effect of slowing the rapid and extremely irregular pulse of auricular fibrillation. This condition, characterized by an extreme irregularity in rhythm, strength and force of heart beat, is due to the fact that the pace-maker has lost is leadership and that the auricular fibers are undergoing continuous incoördinated activity, one fiber relaxing while another contracts. This mob of impulses from the auricle in passing to the ventricle is reduced in number by the auriculoventricular band being unable to transmit them rapidly, and it may be supposed that of those which actually reach the ventricle a certain number are ineffective through striking it at a refractory period in its cycle. But enough of them pass to it to cause a very irregular rhythm, and this is accompanied by a marked loss in efficiency.

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(2) Norsk Mag. f. Laegevid., December, 1916.
(3) Jour. Amer. Med. Ass'n., Dec. 9, 1916.
(4) Lancet, June 9, 1917.

Under suitable doses of digitalis, in this condition, the pulse becomes slower and its beats less unequal, and with this the patient's condition improves in a most unmistakable manner. It might be thought at first that this is due to vagus stimulation; but Cushny and his collaborators have shown that this can not be the chief cause of the improvement, for it occurred even when the vagus was completely paralyzed by atropine.

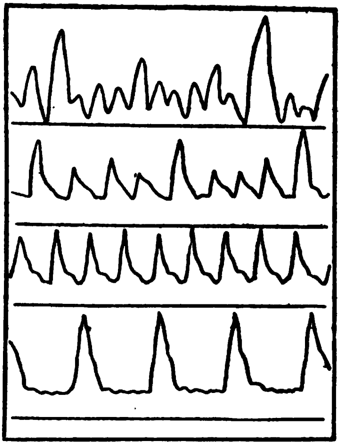

Fig. 7. Tracing of the perfused rabbit's ventricle during auricular fibrillation from electrical stimulation. The highest tracing was taken before strophanthin was applied, the second after it had begun to produce its effect, and the third and fourth after the ventricle had become regular. The fibrillation persisted in the auricles.

Now it is possible to induce auricular fibrillation by means of electrical stimulation (Fig. 7) of the auricle of a perfused heart. When a digitalis body, like strophanthin, is perfused through such a heart, it will ultimately produce a slow and regular rhythm, as shown, even though the auricle be still fibrillating. The reason for this is evidently the fact, that under the influence of such bodies conduction of stimuli from auricle to ventricle is interfered with, and the ventricle beats with an independent slow rhythm, as can be seen in Figure 8, which is the record of the ventricular beats of a rabbit's heart perfused with 1:500,000 of strophanthin in

Ringer's solution. It will be seen that finally the ventricle responds only every third or fourth beat of the auricle, evidently owing to some change in the conduction of impulses from auricle to ventricle. It is a significant fact that this action on conduction is uninfluenced by the addition of atropine.

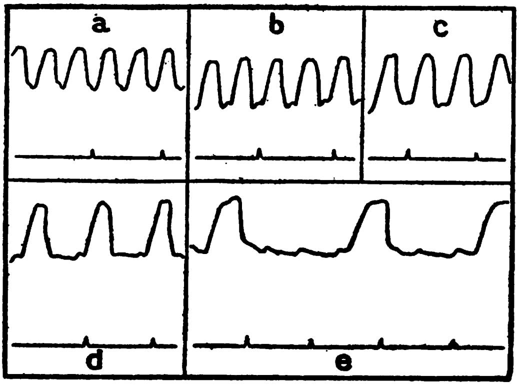

Fig. 8. Rabbit's ventricle perfused. *a*, normal; *b*, slight slowing from strophanthin; *c*, more marked slowing; *d*, half rhythm; *e*, rhythm of 1: 4 and 1: 3; the auricle beats can be seen during the intervals in *e*.

"When a heart is perfused with strophanthin and its response is tested to auricular fibrillation at intervals, it is found that during the earlier stage of slowing the auricular excitation has the usual response in the ventricle; but later, before the actual intermissions occur, the irregularity of the ventricle during auricular fibrillation becomes less marked, and still later the ventricle remains fairly regular while the auricle fibrillates. There can be no question, then, that the decreased conduction of the perfused heart under strophanthin is the explanation of the improvement observed from strophanthin in the perfused heart when the auricle is fibrillating."

[The reader may here be reminded of the fact that this influence upon conduction, which makes digitalis such an excellent remedy in auricular fibrillation, makes it contra-indicated in heart-block or tendency thereto. —Ed.]

Value of Digitalis in Pneumonia. A. E. Cohn and R. A. Jamieson[6] find that, inasmuch as digitalis acts upon the heart during the febrile period of pneumonia, whatever beneficial action it has upon the normally beating non-febrile heart may be expected from its use in the febrile heart in pneumonia. It produces a beneficial, possibly life-saving effect in cases of auricular irregularity (fibrillation and flutter). They arrived at this conclusion by means of electrocardiograms taken in 105 cases of pneumonia. Of these patients, forty-nine received digitalis, while the other fifty-six were given no digitalis and served as controls. That digitalis produced its effect was shown by an increase in the auriculo-ventricular conduction time and in the form of the T wave of the electrocardiogram. The dose and the time required to produce these effects were the same in pneumonia and in non-febrile cases.

It must, however, be understood that what is true of pneumonia may not be true for other infections, such as acute rheumatism, diphtheria, typhoid fever, syphilis and influenza, in which anatomic lesions of the auriculo-ventricular bundle are liable to occur.

Laws of Digitalis Action. These laws are formulated as follows by R. F. Ives:[7]

"1. The reaction to digitalis is far less effective when the rhythm is normal than when auricular fibrillation is present.

"2. Whenever the heart is affected by toxins or agents which increase excitability, digitalis has little effect upon the rate, whether there is auricular fibrillation or whether the rhythm is normal. Thus, in tuberculosis, typhoid, malignant endocarditis, alcoholism, etc., the above holds true.

"3. Experience shows that in auricular fibrillation, especially where there is a large amount of healthy heart muscle, rather than when extensively diseased, the reaction to digitalis takes place. The most marked response is found, therefore, in the youthful type of the

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(6) Jour. Exp. Med., January, 1917.
(7) New York Med. Jour., June 16, 1917.

disorder with a rheumatic history. When fibrillation occurs in the senile heart, especially in the absence of a rheumatic history, the failure to respond is very common.

"4. It is important to realize that digitalis at times so affects the conducting bundle of His as to depress the same with production of partial heart block.

"5. Digitalis proves of inestimable value in restoring muscle tone, or, more properly speaking, the property of tonicity, in myocardial relaxation, especially when resulting from fibroid displacement occurring after the acute toxemias. The responsiveness of the heart to the drug indicates relatively the percentage of good cardiac muscle still present, for with lesions affecting its efficiency it is hopeless to expect a complete recovery of the strength exhibited by a healthy heart."

"The fear of increasing the burden of the heart already laboring against high pressure by raising the pressure by the use of the drug is unwarranted. Such a fear is wholly without foundation, for the consensus today recognizes that in the proper medicinal doses mentioned the drug does not affect the arterial walls, or, if it does, the effect is so slight as to be negligible.

"Digitalis should be used for its physiologic effects, always keeping in mind that stomach symptoms, such as nausea or vomiting, indicate the appearance of its toxic action. Its effects upon the cardiovascular system will always be shown prior to the toxic effects, or at the latest, associated with the onset of gastric irritation. Mackenzie, who uses the tincture, recommends doses of from fifteen to twenty minims three or four times a day, and makes the statement that the average quantity which produces nausea in most cases is from five to eight drams when taken in doses of one dram *per diem*. His estimate of relative strength is that fifteen minims of the tincture equal one grain of the leaves. Regarding the danger of digitalis, it is said authoritatively by those who use it most that they have never seen the slightest danger arise from taking digitalis in the doses given above. If the drug is stopped as soon as vomiting or nausea appears, or when the heart's rate falls to under fifty beats a minute, no apprehension need arise, even though fatal syncope has been attributed to its administration.''

[These are sound propositions. If your text-book on pharmacology does not agree with them, so much the worse for the book.—Ed.]

TOXICOLOGY.

ALCOHOLISM.

Treatment of Inebriates. Institutional care for an indefinite time, with absolute restraint and control, seems to be the most rational plan of treating inebriates, is the conclusion of J. McIver.[1]

He thus describes the present treatment at the Philadelphia General Hospital:

''When these patients are free from symptoms they are sent out to work around the institution. In this way they are kept under absolute restraint and control for one month. At the end of this time if the patient desires he may have his discharge. On the other hand, if he desires to stay longer he may do so providing there is room. The hospital authorities have been very lenient in this respect, allowing those who were really desirous of being cured to remain almost indefinitely and giving them every opportunity possible. There are not a great many, however, who are anxious to stay longer than thirty days. These patients are all anxious to have treatment to aid in the recovery from the acute symptoms of alcoholism, but not many are enthusiastic about remaining in the institution for any considerable time. . . . What they really want are liberty and whiskey. . . . I do not believe the hospital would even think of laying claim to one single permanent cure out of all these thousands of cases. From my own personal experience I am sure that I can not recall one, notwithstanding the fact that many of these cases had remained in the hospital for months or even years and had been brought into the best physical condition. As soon as opportunity presented itself, they became intoxicated. . . . The

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(1) New York Med. Jour., Sept. 30, 1916.

whole thing is that the majority of these people do not care to stop using alcohol.

"The various specific cures have indeed been a great handicap, because they gave people a false sense of security. . . . I am quite sure there is no drug or combination of drugs which will relieve the obsession for alcohol or opium."

What these patients need is care in an institution where they can be kept for months or years; an institution preferably located in the country, with a farm and industrial plant, so as to give employment for the inmates. Their stay in this institution should not be less than three months for the mildest type, and some will have to be kept for a year or more, and it is doubtful if some would ever be safe in facing the outside world. When these people leave the institution they should seek new associates and new surroundings. They should start life anew and engage themselves in some active work fitted to their ability, keeping ever in mind their weakness, at the same time remembering that anything short of total abstinence is sure to prove detrimental and will in all probability be the beginning of their downfall. Many cases, the author believes, are utterly hopeless.

The value of such treatment to the patient would be incalculable. He would be more than self-supporting and become an aid to his family. The procreation of his kind would be largely prevented. From an economic standpoint, the help to the city and to the country at large would be marvelous.

Psychotherapy in the Cure of Alcoholism. This is endorsed by A. H. Burr[2] as its rational treatment. We have, he reminds us, chemical and physiologic antidotes for poisons but not for habits. Psychotherapy can nullify the craving and establish immunity, provided: (1) the patient is absolutely sincere in his desire to be cured; (2) he intends to become a total abstainer for life; (3) he is able to coöperate with the physician by concentrating his mind upon the instructions of the operator, and is able to yield to a passive or even drowsy and sleepy state; and (4) the operating physician is tactful and resourceful in the administration of the right suggestion at the proper time. This treatment is safe, agreeable and economic; but unfortunately not infallible.

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(2) Illinois Med. Jour., 1917, p. 245.

[It seems evident that the treatment must be successful, provided *all* the four conditions stated by Dr. Burr are met. The crux of the situation, so far as success and failure of the method is concerned, lies in the *ability* and the *willingness* of the patient. These may exist so long as alcoholism is merely a habit; but the ability to control the mind is gone in the real alcoholic, in the individual in whom alcoholism is no longer a habit but a disease. Hence the method of psychotherapy advocated by Burr can only be of limited applicability and reach but a small proportion of cases, probably the very patients who can also be cured by various other comparatively simple methods, such as the so-called cures for alcoholism. But what should be done for the great army of alcoholics who are not willing or not able to give up drink? It is these who constitute a terrible menace to humanity, and a constant reproach to medicine for our inability to cure them. There is only one way in which this great problem can be solved; and that is commitment to institutions, such as McIver speaks of, unless it were possible to enforce universal prohibition and the placing of alcoholic liquids that might be used as intoxicants upon the list of proscribed drugs along with morphine and cocaine. As it is at present, the Harrison Act catches the little thieves and permits the robber chief to pillage the land unmolested.—ED.]

One of the results of the world war is the probability that we shall become acquainted with certain forms of poisoning that have hitherto been comparatively rare, among these botulism and poisoning with coal tar derivatives may therefore claim attention here.

BOTULISM.

Botulism, a Danger from Home-Canned Fruits and Vegetables. E. C. Dickson,[3] having collected known cases of botulism occurring in the United States, and finding that a majority of them were due to foods of

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(3) Jour. Amer. Med. Ass'n., Sept. 22, 1917.

vegetable origin, performed some experiments in which he infected vegetables with the spores of *B. botulinus,* and then subjected them to the cold pack process of sterilization; that is, he placed the jars in a wash boiler, and left them in the boiling water for from 120 to 180 minutes, as is generally directed in widely published canning directions, and practiced most extensively by housewives all over this country. Within three weeks, the contents of the jars had undergone fermentation, and had a strong butyric acid odor, all of them showed *B. botulinus* and *B. subtilis,* and the contents of all were poisonous to guinea pigs. Hence the published directions are not sufficient to destroy spores, and the sealed jars or cans furnish an ideal culture medium for *B. botulinus,* which is an obligative anaërobe.

Even though it is probable that only a small percentage of all the canned foods are contaminated with this organism, it is necessary in the interest of safety to regard all food prepared by this process with suspicion.

"The botulinus toxin is easily destroyed by heating and all danger of botulism will be removed from home-canned products if the food is always boiled before it is eaten or even tasted. Under no circumstances should home-canned vegetables which have been prepared by the cold-pack process be served as salad, unless they have been cooked after their removal from the container, and, until it is established what fruits are suitable for the formation of the toxin, it will be safer to reheat all fruits which have been prepared by this method, even though there may be no apparent evidence that the food has spoiled."

COAL-TAR DERIVATIVES.

Anilin Poisoning. W. Lintz[4] reports the case of a workman who inhaled fumes of anilin. He felt weak, especially in the lower extremities, and had severe headache, he tried to walk but was unable and lost consciousness. He became intensely cyanotic, respirations were slow and superficial, pulse was irregular and of poor tension, abdomen distended; finally restlessness and

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(4) Jour. Amer. Med. Ass'n., March 3, 1917.

pulmonary edema developed. A venesection improved conditions, and with oxygen inhalation and the forced administration of fluid, including "Murphy drip" and hypodermoclysis, the patient recovered within four days.

Nitrobenzene poisoning closely resembles anilin poisoning; but can easily be differentiated by the bitter almond odor of the nitrobenzene.

A peculiar form of anilin poisoning consists of vomiting after meals.

Trinitrotoluene Poisoning. This substance, designated in munition factories as T. N. T. has recently created considerable attention in Great Britain, and is evidently becoming of importance in this country, as is shown by an article on the subject by H. S. Martland,[5] who reports two fatal cases; one a rather rare form, assuming the character of an acute aplastic anemia, the other a more common variety showing itself as a toxic hepatitis. A case similar to the last mentioned one is also reported by H. Thursfield.[6]

"The symptoms observed in trinitrotoluene poisoning may be divided into irritative effects due to action of the poison on the skin and mucous membranes, and toxic symptoms due to degenerative hepatitis. The former include nasal irritation with occasional epistaxis, lachrymation and smarting of the eyes, a sensation of constriction in the throat, and dry cough with yellow, bitter sputum. Patients complained of a bitter taste in the mouth, of spasmodic gripping pains in the abdomen, of acid erucations and often of vomiting. Early in the intoxication there was obstinate constipation followed by diarrhea with tenesmus. The skin showed rashes of a cheiropompholix or eczematous type over the face and extremities, most prominent where the sweating was greatest. The toxic symptoms included nausea, vomiting, anorexia, jaundice, mental depression, blurred vision, and transient peripheral neuritis. The poisoning often terminated in delirium, sometimes with coma or with convulsions."

It appears that some workers are insusceptible to the poison, while others show themselves susceptible and lia-

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(5) Jour. Amer. Med. Ass'n., March 17, 1917.
(6) Brit. Med. Jour., Nov. 11, 1916.

ble to develop jaundice between the fifth and fifteenth week of their employment.

IVY POISONING.

Treatment of Ivy Poisoning. M. A. Hays[7] recommends thorough washing of the exposed parts with a saturated solution of baking soda after every probable exposure. "The affected parts should be well-sponged with a cold saturated solution of sodium bicarbonate, and wrapped in gauze which has been thoroughly moistened with the same solution, the moist condition being maintained by adding fresh solution and covering the entire dressing with oiled paper or oiled silk; on the face or other parts of the body, where it is difficult or impossible to retain dressings, the parts may be frequently sponged with the solution, or a thin paste made of cold water may be applied. Hair is turned a dirty brown color by strong solution of sodium bicarbonate, hence diluted Burow's solution (solution of aluminum acetate) or a 1:10,000 solution of mercury bichloride may be substituted for use about the forehead, the moustache, or the beard."

Alkali, and especially baking soda, seems to be the most generally favored remedy in the symposium dealing with this topic in the *New York Medical Journal.* J. O. Carrington recommends scrubbing with hot soapsuds, so does Dr. H. Koplin, who afterward applies fluidextract grindelia robusta one part to nine parts of water.

S. Weingrad orders his patient to make a thick suds of plain laundry soap to be applied to the affected part until it dries up. This usually takes about ten minutes, and is to be followed by a washing of the dried soap suds with a lysol solution, one dram of lysol to two quarts of cold water.

E. v. Adelung[8] advises application of cotton-seed oil or soap suds, before exposure to all exposed skin surfaces, and to use soap in some form every hour during exposure. As soon after exposure as possible, he advises that the following precautions be taken: "Take

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(7) New York Med. Jour., Nov. 4, 1916.
(8) Jour. Amer. Med. Ass'n., Sept. 22, 1917.

a complete soap and hot water bath, not neglecting the hair. Change all clothing including hat and shoes, and avoid contact with clothing or other articles that have been exposed, until they have been freed from the poison."

See also page 102.

MERCURY.

Mercurial Poisoning. No other subject in toxicology has occupied so much of current literature as mercurial poisoning. The justification for it may be found in a letter to the Editor of the *Journal of the American Medical Association* by Murray Galt Motter,[9] in which he states that the U. S. Hygienic Laboratory has collected, from January 1st to June 30, 1917, from reports in the public press, 707 cases, of which sixty-one have been reported as fatal, which would amount to a mortality of 8.5 per cent. Motter points out, however, that this probably does not represent the real mortality of mercurial poisoning, because many of these cases have been dismissed as recovered when they have been under observation for but two or three days, whereas serious symptoms and even death often occur much later.

Prophylaxis of Mercurial Poisoning. After a good deal of discussion, mercuric chloride tablets have been introduced into the new Pharmacopoeia,[1] under the name "Poison Tablets of Corrosive Mercuric Chloride" (Toxitabellae Hydrargyri Chloridi Corrosivi), each of which contains 0.5 gm. of corrosive mercuric chloride and a similar amount of sodium chloride. They must be colored blue, have an angular shape, and word "Poison" and the skull and cross bones design distinctly stamped upon them. Still, in view of the fact brought out by Motter that more than half of the cases are suicidal, the markings described by the Pharmacopoeia may actually invite using these tablets for this purpose. If this is true, we must look for an increasing number of cases of corrosive sublimate poisoning during the next few years. It would probably be best, if tablet form

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(9) July 14, 1917, p. 140.
(1) 9th edition, p. 470.

were reserved for substances to be taken internally; and if it were made more difficult rather than easier to obtain and use mercuric chloride.

Antidotal Treatment. In the study of the efficiency of antidotes, animal experimentation is of the utmost importance. There are too many features of uncertainty connected with clinical cases to make any but a very large series of much value. In the first place, the amount taken can not always be definitely ascertained. The question whether the stomach was full or empty is of the greatest possible importance in shaping the further course of the case. Still more important is the time of onset and thoroughness of evacuation by means of emesis, as well as the time when the antidote was administered, which differs from case to case. The subsequent treatment including diet can hardly be exactly reproduced in various cases; and no physician would feel justified in permitting himself to experiment upon his patient to such a degree as to merely administer the antidote and no other treatment. In a carefully planned animal experiment, all of these conditions may be controlled. It must be admitted, however, that animal experiment may be just as misleading, if all the above mentioned factors of uncertainty are not carefully eliminated.

B. Fantus[2] has attempted to meet all the requirements of a scientific experiment in the study of the question, which one of numerous antidotes recommended offered the patient the best chance for recovery. The following graphic summary of the average lethal period, when the antidote was given immediately after the poison illustrates some of his results.

It will be seen from this table, that egg albumen has some value in prolonging the life of animals: this occurs only, however, when it is given immediately after the poison. When egg albumen was given five minutes after the poison, it proved worthless. There is every reason why the use of egg albumen as an antidote for mercuric chloride should be discarded, unless indeed there were absolutely nothing else at hand. Milk and serum albumin, which are occasionally mentioned as substitutes

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(2) Jour. Lab. and Clin. Med., 1916, Vol. 1, No. 12.

for egg albumen as antidotes, were found worthless even when given immediately after the poison.

The use of potassium iodide and quinine, suggested by Hall (1915) proved valueless. Sodium sulphate, potassium bitartrate and sodium carbonate were useless as antidotes. On the other hand, sodium bicarbonate and sodium acetate seemed to have a moderate antidotal value.

Certain reducing agents gave the best results, most especially sodium phosphite and sodium hypophosphite. Curiously enough, however, they are of little or no value when given alone; but when mixed with acetate they have considerable antidotal efficiency, as will be seen from above table. The combination of sodium phosphite, 0.36 gm. with sodium acetate 0.24 gm., which is obtainable in tablet form, was suggested by Thomas H. Carter (1914), though G. A. Linhard[3] claims priority for suggesting phosphite as an antidote to mercuric chloride. In the article referred to, Linhard gives directions for the

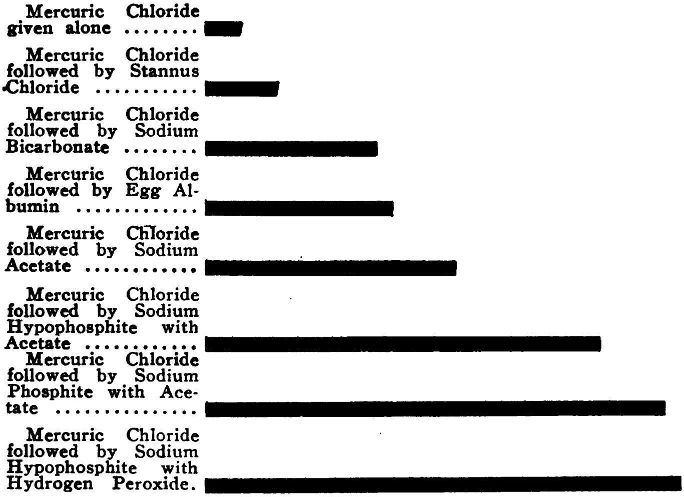

Fig. 9.

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(3) Jour. Lab. and Clin. Med., 1917, vol. 2, p. 722.

preparation of pure sodium phosphite, and suggests that it be used intravenously in mercurial poisoning.

When sodium phosphite is not available, a combination like the following is recommended by Fantus as antidote:

Sodium hypophosphite	1.00 gm.
Hydrogen peroxide	5.00 ml.
Water	10.00 ml.

If the amount of the poison is known, ten times as much of the hypophosphite should be given as poison was taken. As this might require a large and possibly harmful amount of hypophosphite, it should immediately be followed by lavage with a very dilute solution of the antidote. This may be followed by a safe dose of the antidote, which is to be retained, and which might be repeated every eight hours for several days.

In a later study, Fantus and Hyatt[4] endeavored to determine whether phosphite or hypophosphite is to be preferred. The phosphite acetate combination above referred to gave, on the whole, the best results; though the results with the hypophosphite peroxide mixture were but little inferior.

Calcium Sulphide an Antidote to Mercuric Chloride. J. H. Wilms[5] believes that calcium sulphide is the chemical and clinical antidote for mercuric chloride poisoning. He advises injecting intravenously an aqueous solution of calcium sulphide, 1 grain to the ounce of distilled water. The solution is prepared by dissolving the calcium sulphide in boiling water and filtering while hot. The solution should be freshly prepared, as it gradually deteriorates on keeping. For each grain of bichloride taken, 1 grain of the antidote should be used. The calcium sulphide may also be taken by mouth, 1 grain every hour, when the intravenous method is not practicable; or both methods may be combined. Wilms reports eight cases with one death, or a mortality of 12.5 per cent., though the patient who died was in a moribund condition before the administration of the antidote was commenced. Wilms also reports experiments upon dogs,

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(4) Ibid., 1917, vol. 2, p. 813.
(5) Ibid., 1917, vol. 2, p. 445.

which do not impress one as being very convincing, as all the animals vomited more or less promptly. He also cites experiments by Maltanor, in which however the dose of mercuric chloride used was somewhat less than the certainly fatal dose for rabbits; and only four animals were treated, with one death. Nevertheless, the results are sufficiently encouraging to demand further investigation, most especially by animal experimentation. The fact brought out in Wilms' report that human beings can be given, without harm, 7.5 grains of calcium sulphide dissolved in 7.5 ounces of water is certainly interesting and important.

H. L. Holm[6] also recommends calcium sulphide, in doses of 0.06. to 0.30 gm. depending upon the severity of the case, administered by mouth or by rectum every half to one hour, until the odor of hydrogen sulphide becomes distinctly perceptible from the patient's breath. The quantity and frequency is then diminished, but the treatment continued until all symptoms have disappeared. In place of calcium sulphide, liquor calcis sulphuratae, N. F., or in case of emergency even the common "lime sulphur" spraying solution may be used.

Alkaline Treatment. W. deB. MacNider,[7] by an elaborate study of the acid-base equilibrium of the blood in acute bichloride intoxications, found that the late nephritis was constantly associated with and showed parallelism to the phenomena of acidosis.

This suggests, he thinks, that alkaline treatment ought to be instituted in the later stages of mercurial poisoning; and that the success of the Lambert and Patterson treament may, in part, be due to this alkalinizing tendency.

G. E. Brown and L. W. Baskett[8] report a serious case of mercuric chloride poisoning treated successfully by the Lambert and Patterson method. This treatment consists of:

1. Prolonged gastric lavage, repeated twice daily, until the washings fail to give reaction for mercury.
2. Colonic irrigations twice daily.

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(6) Jour. Mich. State Med. Soc., July, 1917.
(7) Proc. Soc. Exp. Biol. and Med., 1917, vol. 19, p. 140.
(8) Jour. Amer. Med. Ass'n., June 2, 1917.

3. Proctoclysis, by the continuous drop method, with an approximately 1 per cent. solution of potassium acetate.

4. Copious ingestion of fluids by mouth: 240 ml. of milk every two hours, to be alternated with 240 ml. of the following solution given every two hours:

Potassium bitartrate	4 gm.
Sugar	4 gm.
Lactose	15 gm.
Lemon juice	30 ml.
Boiled water	500 ml.

5. To this treatment is added a daily hot pack.

H. B. Weiss,[9] basing his treatment upon Fischer's hypothesis of colloidal swelling due to acidosis, gives intravenous injections of Fischer's solution, which consists of sodium carbonate crystals, 10 gm., and sodium chloride, 15 gm., to 1,000 ml. of water. He gives from 1,000 to 1,500 ml., depending upon the condition of the heart of the patient, if the patient does not reach medical aid for at least three hours. He, however, omits the intravenous injection, if the patient has vomited within 15 minutes after taking the poison, if he took only about 1 gm., and if the amount of urine voided is close to normal limits and the urine becomes alkaline by medication by mouth within the first twelve to twenty-four hours.

Weiss endeavors to keep the urine alkaline to a saturated solution of methyl red in alcohol for from ten to twelve days, as Fischer has shown that if the urine of a nephritic can not be made alkaline to methyl red, this patient continues in a dangerous state. If the urine continues acid to methyl red, the intravenous injection should be given without delay, and repeated, if necessary. Usually the oral administration of a modification of the old "imperial drink" suffices to keep the urine alkaline. It consists of potassium bitartrate, 4 gm., sodium citrate, 2 gm., sugar, 4 gm., with lemon or orange juice to taste, to 240 ml. of water. The patient is given six or eight glasses of this drink each day.

In addition to this alkaline treatment, Weiss practices

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(9) Jour. Amer. Med. Ass'n., June 2, 1917.

gastric lavage with milk and white of eggs [which is worthless as an antidote,—Ed.] on admission, but not afterward. He leaves in the stomach 90 gm. of magnesium sulphate in 180 ml. of water. The patient is also given a soap suds enema. The patient is urged to drink as much water as he can; and is allowed a liberal diet—almost anything except an excess of protein. Of twenty-five patients treated in this manner, all recovered.

[It will be seen that Weiss's treatment is very similar to that of Lambert and Patterson, except that the frequent gastric and colonic lavage recommended by them is omitted. If the more radical use of alkali be the cause of the apparently even better results of Weiss, it is evident that it could be employed still more energetically. Some such alkaline and eliminant treatment coupled with the administration of a reducing agent as antidote, would, in the light of our present knowledge, constitute the best treatment for mercurial poisoning.—Ed.]

Removal and Elimination of the Poison. W. H. Burmeister[1] reports on copious venesection followed by transfusion of normal blood in experimental mercurial poisoning in dogs and rabbits. [His results, however, are not encouraging enough to consider the method as likely to be of clinical importance. The suggestion of possibly removing the mercury from the drawn blood of the patient by electrolysis and re-introducing it by transfusion, is not very likely to become of practical importance because of the technical difficulties of the procedure, even if experimental results were sufficiently encouraging, which however they are not.—Ed.]

MORPHINISM.

The gradual withdrawal method is the one endorsed by E. W. Markens,[2] as the result of a study made in Essex Prison and House of Detention. "The average first daily dose given is one and a half grains of morphine (morphine being the only drug prescribed, regardless of the fact that many patients are suffering from the

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(1) Jour. Lab. and Clin. Med., 1917, vol. 2, p. 500.
(2) New York Med. Jour., Sept. 9, 1916.

effects of other drugs). The dose is reduced according to the condition of the patient, sometimes a quarter grain a day or perhaps the same amount in two or three days. On rare occasions it was found necessary to increase the dose a quarter grain for a day or two.'' During the first twenty-four hours the patients suffer from nervousness, insomnia, anorexia, nausea, and rarely vomiting. Pains in the lower extremities are noticeable in every case. Purgation is not resorted to, except in rare cases, when gastric lavage is also employed. The regular prison fare is given three times a day. The treatment in this series of cases extended from five to twenty-eight days. In every case the patient was off the drug for at least ten days before being discharged, and in many cases for three or four weeks. Very little ill effects were experienced after the first twenty-four hours, and in every case a gain in weight was noticeable. There is no way of telling how lasting the cure is; but a fair percentage write from time to time after their discharge to tell how well they are doing and that they have not returned to the use of the drug.

M. Loewenthal[3] also uses the gradual withdrawal method; and, in addition, twenty-four hours after having given the smallest dose of morphine he keeps the patient under the influence of scopolamine for about fifteen to twenty hours, using 0.0002 to 0.0003 gm. hypodermically every four hours. For the after treatment it is advisable to keep the patient under strict observation for two or three weeks. It is generally well to give a tonic; and veronal or sodium bromide for sleeplessness and restlessness. For patients with very low vitality it would take from three to four months for this treatment. It is also of great importance to have these patients under observation for a period of time after their discharge.

W. D. Partlow,[4] assistant superintendent Bryce Hospital for the Insane, says: ''It is an easy matter in an institution to separate the patients from the drug and keep them separated for a sufficient length of time for the drug to be eliminated and the patient to recuperate from the toxic effects of the morphine and return to his

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(3) Cleveland Med. Jour., September, 1917.
(4) Southern Med. Jour., Sept. 1, 1917.

former state of health, . . . but no weakness or
version of desires, tastes or feelings can be erad
by medical treatment, as is popularly believed.
that nothing worth while has been accomplished
we can get co-operation from the outside. In the
place, it should not be possible for a person to
opiates on which to form a habit; and especially
habit is once formed, then certainly it should be
sible for that person to obtain the drug without
the habit could not continue. The desired e
practically be attained by an honest, earnest co
of officers of the law, doctors and druggists."

Ambulatory treatment is considered practica
S. Tuchler,[5] who says regarding it: "In orde
this method of treatment a success, it is ne
obtain the full confidence of the patient a
impress upon the addict that there will be n
either mental or physical. This with the am
with his honest co-operation, there will be a
without the necessity of going to a hospital
age the drug habitue to make a trial of it.
impressed upon to follow the directions clo
estly. His medicines must be taken with re
the opiate must be reduced but very little ti
three days, perhaps a quarter grain each time
be cautioned not to reduce it too quickly
enthusiasm he may do, as that will upset the
ical balance of his system. Usually the drug
at the successful reduction of the an w
to succeed when once it is undertaken, th
suffering and inconvenience it entails. This an
patient to leave it off too quickly, the system
the adequate balance of the system, t
result in the successful accomplishment
is safer to make haste slowly. It may ta
two, or even six months; but, if the plan
carried out, success will surely crown one's
In addition to the extremely gradual wit
the opiate, Tuchler uses cholagogue cathartic
and podophyllum) at the beginning, and then
nation tablet with atropine and strychnine

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(5) Calif. Eclect. Med. Jour., October, 1919.

ingredients (containing also xanthoxyloid and cactoid as well as nuclein). To overcome extreme nervousness he uses a mixture of passiflora and scutellaria.

WAR TIME ECONOMY IN DRUGS.

A great deal is written these days about food conservation, but not much about conservation of drugs. John Foote,[6] in an interesting article on the "Geography of Medicines, and the War's Effect upon the Sources of Supply," notes that "No merchant sells more diversely born or more widely traveled merchandise than the pharmacist, and accordingly no business is so quickly disorganized when trade routes are disturbed as the importing and distributing of drugs; for the arteries of trade are like the arteries of the human body—sensitive throughout to any change in the volume of flow in even the most remote branch.

"The changes in drug prices which have come in this war are due chronologically to the blockade of Germany, in relation to the enormous chemical manufacturing industry of that country; to speculation in existing stocks at the outbreak of the war; to the congestion of transportation both by land and sea and terminal facilities in belligerent countries; to the removal of blockaded shipping from world trade, causing a shortage of sea transports; to the destruction by commerce-raiders of shipping and cargoes and the high marine insurance and freight rates; to the diversion of labor to war purposes from trades concerned with the gathering, marketing, or manufacturing of drugs and medicinal substances, and to the accumulation of stocks of drugs by army organization."

A few further quotations taken at random may reveal some facts of interest to the reader.

"To gain possession of existing stores of German manufacturers, and especially of German patented chemicals, was the game certain gentlemen played, and at such enormous profits as to make plungers in 'war brides' of later days seem conservative bankers by

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(6) National Geographic Magazine, September, 1917.

comparison. For instance, the speculator who in July, 1914, invested $1,000 in antipyrin . . . would in 1915 or 1916 have a profit on his purchase of $19,000, with no possible chance of a slump in the market. This was practically true of all patented German medicinal chemicals.

"It is not generally known that most of the castor beans from which castor oil is pressed come to the United States from India. Indeed, our annual importation in normal times is nearly a million bushels. . . . Today importers are viewing with apprehension (and children with joy) the castor-oil situation. Not only is production lessened, but the difficulties of sea transportation from India are increasing with the lack of ships. In fact, earth, and heaven, and ocean seem to conspire against castor oil; submarines are ambitious to send it to the bottom of the sea, while aeroplanes demand it as a lubricant in large quantities.

"The price of Norwegian cod-liver oil is an index of submarine efficiency. In 1914 the oil sold for 60 cents a gallon; in 1916 for $5.50. Perhaps the German scarcity of animal fats has also something to do with this increase. The rise in price and scarcity of the much-used Russian mineral oil in the first year of the war will be remembered. Here, America has been able to utilize native products to supply the deficiency.

"The war bore heavily on bald-headed and nervous people. Practically all hair tonics nowadays contain resorcin—a coal-tar product we have always allowed Germany to make for us. . . . From $2 to $32 rose the price of a pound of resorcin, putting a sudden damper on the enthusiasts of intensive scalp culture. And the bald found it costly to be nervous over this advance, since bromide of potassium . . . advanced from 50 cents to several dollars, and at one time touched $12 a pound! These excessively high prices were speculative phenomena, and did not hold at the maximum level, though bromide is still $1.20 a pound and resorcin $24 a pound.

"Some of the most remarkable advances in price are seen in vegetable drugs. Russian henbane . . . jumped from 8 cents a pound in 1914 to $3 a pound in 1916. Belladonna . . . was cultivated for commercial purposes in Germany and in England. The cutting away of the German supply caused the price to rise from 50 cents to $1.75 a pound within the first year of the war. Opium increased in price very gradually from $9.05 in July, 1914, for crude gum, to $35 per pound today. Heroine sells to-day at $14 an ounce. The tremendous use of anodyne medicines to relieve the pain of the millions of wounded has undoubtedly had a stimulating effect on the price of opium and morphine.

"Camphor . . . was an example of efficient production and control of output. After the Japanese-Chinese War, Japan obtained control of the Formosa camphor industry. Although the Formosa forests are practically inexhaustible, forestry measures were instituted for replanting and care of trees; 2,000 police were furnished to protect workers, and large refining plants were built. Workers were paid a fixed sum. The distribution of the entire products was let by contract and the right of sale awarded an English firm, the latter contracting to conduct the sale of camphor in New York, London, Hamburg, and Hongkong, and to accept from Japan a definite amount of camphor each year. The closing of the port of Hamburg has not, however, demoralized the trade. In July, 1914, American refined camphor sold at 44 1/2 cents per pound in barrel lots. In 1916 it had advanced to 90 cents."

The question may well be asked, what shall we do about this? The answer to this may be found in a series of articles on "The Use of Inexpensive Drugs in Practice," by L. T. de M. Sajous,[7] in which he says: "Unnecessary expense is constantly being incurred through failure to utilize to the full extent the resources which the U. S. Pharmacopoeia actually affords, in particular as regards substitution of the less for the more expensive drugs."

Among the hypnotics, chloral hydrate, while still selling at a price approximately twice that prevailing before the war, remains by far the least expensive pure hypnotic drug from the double standpoint of efficiency and

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(7) New York Med. Jour., 1917—March 24, 31, April 7, 14, 21, May 5, 12, 19, 26, June 2, 9, 23, July 14, 21, Aug. 11, 18, 25.

cost. Sulphonmethane (sulphonal) and sulphonethylmethane (trional), though fairly strong hypnotics, present the disadvantages of acting slowly, of causing more or less persistent depression after the awakening, of occasionally irritating the kidneys, and of sometimes giving rise upon repeated use to a dangerous form of cumulative poisoning. Their substitution for chloral hydrate may at times seem advisable because of their lack of unpleasant taste and gastric irritant properties, but prolonged use—as in the case of other hypnotics, in less degree—is to be avoided. The cost of sulphonal and of trional is about twenty times, dose for dose, that of chloral hydrate. Probably the chief rival of chloral hydrate, at the present, is veronal. This agent, while almost as efficient as chloral, is by no means free from the possibility of toxic action, as seems to be assumed by some practitioners. Veronal seems to have the tendency to produce peripheral vascular paralysis, several instances of fatal collapse through this action having resulted from administration of only 0.6 to 1.0 gm. In view of this risk, and of its cumulative tendency, which is somewhat similar to that of sulphonmethane, though less marked, as well as because of its very high cost, there seems little reason for using it instead of chloral, even in the presence of circulatory weakness.

Owing to the high price of opiates, advantage might be taken, when hypnotic effect is desired, of the potentiation that has been shown to occur when morphine and chloral are simultaneously administered, less than half the dose of each of these drugs being required to produce the hypnotic effect that a whole dose of either remedy would exert if given alone. Where pain is to be relieved and sleep secured in the absence of any tendency to weak heart action, the substitution of acetanilid for any or all of the morphine otherwise to be given may accomplish the desired result, though it must be remembered that in pains due to inflammation or other organic trouble morphine is the more efficient remedy. The relative inexpensiveness of the entire drug, opium, as compared with that of its alkaloidal derivatives, is particularly to be borne in mind: the effect on the cough reflex, for instance, being obtainable at less than one-half the expense entailed in case of morphine; and, in the treatment of excessive peristalsis and diarrhea, opium is not only less expensive but also more efficient than is morphine.

Mansfield and Hamburger (1915) have shown that the action of chloral as well as that of morphine is reinforced by alcohol and by ether. Hence spirit of ether may, with advantage, be added to chloral hydrate, or used internally before an injection of morphine, to permit reduction in the amount of morphine or chloral, though in view of the high cost of ether no reduction in expense is to be expected. [Such combinations of drugs for synergistic action lessens, however, the undesirable effects of each of them by lessening the amount of each ingredient required to obtain the desired result.—Ed.]

Scopolamin, owing to the small size of its dose, is one of the least expensive of hypnotics. A dose of 0.0003 gm. (gr. 1/200) costs only one-third as much as 0.015 gm. of morphine sulphate or 1 gm. of chloral hydrate. Combination with scopolamine, 0.0002 gm., would increase the effect of morphine and lessen expense as well.

Sajous does not believe that combination of scopolamine with chloral or bromide results in potentiation; but that expense reduction would result from substituting scopolamine for chloral in the popular chloral bromide mixtures, though there would also be a certain degree of reduction in hypnotic power.

Potassium bromide exceeds sodium bromide in cost by nearly 150 per cent. The strontium and ammonium salts are almost twice as expensive as sodium bromide. Hence, while the sedative power of sodium bromide is admittedly below that of the potassium salt, its substitution for the latter, even in larger doses, seems advantageous in view of the present great difference in cost. None of the newer official or unofficial hypnotics exhibit sufficient advantages, in view of the reliable official hypnotics at hand and the extremely high prices at which most of these imported agents are sold, to warrant their use.

Antipyrine and acetphenetidin have in recent months been selling at an approximately equal figure. They are weight for weight about 26 times as costly as acetanilide.

As, however, the latter acts in a dose about three-fifths [or less—Ed.] that of the other drugs, acetanilide would appear to be dose for dose approximately 43 times less expensive than the other two. A careful study of available statistics shows that the risk of fatal poisoning from acetanilide, when prescribed by the physician, is probably less in comparison with that attending the use of antipyrine or acetphenetidin than has been generally supposed. The relation of fatalities from these three agents might be expressed by the factors 2.71 for acetanilide, 1.93 for antipyrine, and 1.65 for acetphenetidin. The impression of a far greater lethal power on the part of acetanilide, while correct up to a certain limit, seems to be due to the greater frequency with which it has been used in an ill-advised and indiscriminate manner by the laity. When it is used by the physician, it becomes a safe drug, if its dose is moderate, if it is never pushed in case desired result is not obtained, if it is discontinued immediately on the appearance of even a slight degree of cyanosis, and avoided altogether in patients with a tendency to asthenia or asphyxia. The Medical Department of the United States Army has substituted acetanilide for acetphenetidin.

Sodium salicylate is about one-fourth as expensive as acetylsalicylic acid; and, inasmuch as the former is a more powerful antirheumatic than the latter and not more irritant to the stomach, if it is combined with twice its weight of sodium bicarbonate; and, as Hanzlick has found acetylsalicylic acid to be 1 1/2 times as toxic to human beings as sodium salicylate, there is every reason for prescribing sodium salicylate in the treatment of acute articular rheumatism rather than acetylsalicylic acid. However, acetylsalicylic acid is more antipyretic and analgesic than is sodium salicylate. In view of the fact that acetylsalicylic acid is, weight for weight, eight times as expensive as acetanilide; and hence, dose for dose, twenty times as expensive, there is reason for trying the latter before resorting to the more expensive drug, whenever the antipyretic and analgesic action is desired.

Cocaine has undergone relatively little increase in price; and, inasmuch as its substitutes, such as novocaine, stovaine, alypin, and even betaeucaine, are at present practically unobtainable, cocaine must be used as the local anesthetic. The danger from its somewhat greater toxicity may be overcome by combination with epinephrin, as well as by using it in normal saline solution to which 0.5 per cent. of potassium sulphate has been added, which, as was shown by Kochman (1914), doubles the anesthetic value of the cocaine. Furthermore, the use of dilute solutions and perfect technique in the application of the agent will suffice to remove practically all danger from cocaine as a local anesthetic.

While the price of belladonna and hyoscyamus has risen greatly since the beginning of the war, stramonium, the common Jimson weed, has remained relatively inexpensive. Stramonium leaves are at present one-seventh as costly as belladonna leaves. As far as the action of stramonium as compared with belladonna is concerned, it is practically if not exactly identical. Hence stramonium might well be substituted for belladonna, noting in doing so that the dosage of stramonium, to be precise, should be made one-fifth larger than that of belladonna. Hyoscyamus is now, weight for weight, about twenty times as costly as stramonium; and taking into account the difference in alkaloid percentages—0.065 instead of 0.25 per cent.—about eighty times as costly dose for dose. A very inexpensive yet efficient substitute for hyoscyamus could probably be made by carefully incorporating a small amount, say 0.05 per cent., of scopolamine with stramonium in its preparations and diluting the latter enough to correspond with the normal alkaloidal strength of hyoscyamus. The increased expense now attending the use of atropine could, at times, doubtlessly be avoided by its use in the form of the crude drug preparations, especially those of stramonium. Atropine still embodied in this drug is about one-tenth as expensive as atropine sulphate.

At present physostigmine (eserine) salts are about five times as expensive as those of pilocarpine. For myotic purposes and to lower intraocular tension pilocarpine, in addition to being less irritating to the eye than eserine, is thus less expensive than the latter. The difference is, however, lessened owing to the fact that a solution 50 to 100 per cent. stronger is required in case of pilocarpine. For internal administration advantage might be taken of the fact that the isolated alkaloids in case of these plants cost about four times as much in each instance than when employed in the whole drug; and the action of the latter is qualitatively almost, if not quite, the same as that of the pure principles, though no doubt in general less rapid and quantitatively precise. The former view of the presence of antagonistic principles in these drugs has not been confirmed by more recent studies.

Digitalis has doubled in value; strophanthus seed has become almost four times as expensive as before, while squill has risen by about 50 per cent. Powdered digitalis leaf is, dose for dose, about ten times less expensive than the tincture.

The price of caffeine has increased in price by over 250 per cent. since 1914; and, dose for dose, is over 25 times as expensive as digitalis leaves. The price of caffeine sodiobenzoate or of the corresponding sodiosalicylate is nearly three times as great, dose for dose, as either pure or citrated caffeine. To obtain the advantages of the greater solubility of the double salts of caffeine, without incurring the additional expense, advantage may be taken of the fact that the admixture of an equal part of sodium citrate (more exactly 1.12 parts) or of sodium acetate (1.66 parts) form very soluble caffeine combinations, which would be much cheaper than the benzoate or salicylate.

Ingestion of ammonia water or ammonium carbonate in appropriate dose and dilution is the least costly method of exciting vascular contraction through irritation of peripheral sensory nerve endings. Strychnine is one of the least expensive direct stimulants of the vasoconstrictor center. Among the drugs that act by direct stimulation of the vessel wall, epinephrin, as expensive as it is (about one hundred times as expensive dose for dose as is strychnine), is yet approximately one-tenth as costly as a dose of liquid pituitary extract (Liquor hypophysis, of the new pharmacopoeia).

Among the vaso-dilators, nitroglycerin is considerably less expensive than amyl nitrite. The difference in the rapidity of action between the two is not sufficiently great to render unjustifiable the substitution of the former for the latter in many instances, even in emergencies. Where more prolonged action is desired, sodium nitrite, which, dose for dose, is even slightly less expensive than nitroglycerin, deserves to be preferred. Erythrol tetranitrate is at present seventy-five times more expensive than sodium nitrite; and though more prolonged in its action than the latter, it is liable to produce prolonged headache, and besides it is dangerously explosive, while sodium nitrite is nonexplosive. The erythrol preparation might, however, be unequaled by any other body of this group for those patients with angina pectoris who are awakened at night by the pain. Spirit of nitrous ether is about five times as expensive, dose for dose, as nitroglycerin. The substitution of a simple mixture of alcohol containing 0.25 minim of the spirit of nitroglycerin to every thirty minims of undiluted alcohol, would probably be justifiable.

NON-PHARMACAL THERAPEUTICS.

The Value of Physical Methods of Treatment. Of methods of treatment such as electricity, *x*-ray, vibration, light, heat, massage, and water, O. B. Beer[2] has this to say: "These things are not held up as cure-alls, but surely do constitute a very important branch of medicine. They have long passed the experimental stage and are being recognized and used more and more by the up-to-date physician. The author is not a drug nihilist but a strong believer in their use and has seen many lives saved by medicines. But the use of drugs has been and is greatly abused. Why do so many of our patients drift to the drugless healer? Simply because we can not give them what they want, cure them without making a drug shop of their stomachs. What do we have to offer when medicines fail? The majority of us have nothing. We have become so set in our ways that the advance in therapeutics has long since passed us. We still stick to the prescription pad and the nauseous con-

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(2) West Virg. Med. Jour., February, 1917.

coctions of the past, while our friends the faith healer, the osteopath and the chiropractor get the business. And why? Simply because we are too lazy or too stubborn to advance in methods of treatment. The fellow who condemns these advanced methods is the one who knows nothing about them and to mention the use of electricity in the cure of diseases to him is like waving a red flag at an angry bull. He would not know the difference between the positive and negative poles of the direct current or whether it had any poles.

"What has the average hospital to offer in the way of treatment? Most hospitals are splendidly equipped for surgery and are capable of taking care of the usual run of acute diseases, but outside of this the majority are lacking in facilities to treat the vast army of chronics who by proper methods could be cured or at least made comfortable. The surgeon as a rule when he finds nothing for which to operate usually loses all interest in his patient."

[To all this the Editor says: Amen. He would add, that our quarrel with the drugless healer is not that he uses a method of treatment, but that he does not know enough to use *all* methods of treatment known to mankind. The practice of most physicians is, however, just as reprehensible, for they are mere druggers, one-method therapeutists. So long as this state of affairs lasts, drugless healers will not only get our patients, obtain legal recognition, but will actually cure some of those patients that we were unable to help. And yet conditions are almost hopeless, for the leaders in medicine, those who formulate curricula for medical schools know little or nothing about these methods of treatment. Thus they do not provide for instruction in these branches in the medical schools. The result is that the graduates from these schools among whom are the future leaders of medical thought and framers of curricula know nothing about these things. And thus a self-perpetuating vicious cycle has become established. Is it bound to continue until the end of time?—ED.]

[illegible] These are dis- [illegible] which we [illegible] disor- [illegible] I need [illegible] gout [illegible] all of [illegible] on you [illegible]

[illegible] It is now [illegible] products of [illegible] the per- [illegible] the diet [illegible] dependent [illegible] the change [illegible] or other [illegible] other pre- [illegible] must give up [illegible] animal [illegible] poisons [illegible] the same [illegible] in the [illegible] the bowels [illegible] we need [illegible] The inges- [illegible] regularity [illegible] small percentage [illegible] necessary [illegible]

[illegible] Leaving [illegible] symptoms [illegible]

[illegible]

tation occurs in the stomach, and the gas and acids formed irritate the gastric mucosa, and finally the much-abused organ rebels and expels the noxious material. Bile is apt to regurgitate through the pylorus, and is vomited after the food is expelled. . . . The treatment is obvious; reduce the amount of high percentage carbohydrate in the food, and teach the patient to chew the remainder carefully, so that the thorough mixing of the saliva with the food will promote normal digestion and prevent fermentation.''

Rheumatism, gout, and ''red meat.'' ''Rheumatism, then, is an infectious disease, and its course can not be altered by abstaining from eating meat, red or otherwise. The focus of infection must be found . . . , and a diet given to correct the accompanying anemia and to build up the atrophied muscles. A rather high proteid diet with plenty of meat included is indicated (Billings). Plenty of fruit should be included to help maintain the normal reaction of the blood and urine. As it has been demonstrated that practically all the fruit and vegetable acids except benzoic (occurring in prunes, plums, and cranberries) form alkaline carbonate when absorbed and oxidized, we must discard the idea that acid fruits and vegetables are harmful in rheumatism because they make the blood too acid. On the contrary, they increase the alkalinity and help to neutralize the acids formed in the metabolism of the proteids and fats. Grape fruit, oranges, and lemons are especially valuable in combating acidosis. Gout is a different problem. . . . We now know that beef contains less than one-third the amount of uric-acid-forming products that lamb, veal, or chicken contain. If we wish to give our gouty patient some meat, a nice juicy sirloin is about the best variety we can choose. The old red-meat idea dies hard, but it must be relegated to the scrap heap. Plenty of fruit, vegetables, and water, with a moderate amount of beef, mutton, venison, or fowl, with fish, milk and eggs in fairly liberal quantities, seems to be the diet on which gouty patients do best.''

''*In chronic nephritis,* . . . one of the most important points for consideration is the amount of protein to give. . . . Too great a reduction in the protein intake is harmful, and certain cases show marked improvement on increasing the protein content of the diet considerably above the accepted standards. We would say, then, that the amount of protein should vary between 40 and 90 grams daily, according to the excretory ability of the kidneys. . . . There is no necessity of keeping these patients on a meat-free diet. The total protein intake is the important point. The amount of water to be given is another important point. If the kidneys can eliminate a urine of only 1.015 specific gravity, we must give enough fluid so that the waste products may be eliminated at that concentration or less, if the kidneys will take care of the necessary fluid. In some cases of chronic nephritis, the milder symptoms often promptly disappear by such simple means as increasing the fluid intake. The daily ingestion as well as the output of fluid must be observed, and the patient must be watched carefully for edema. How much salt to allow is another debated question. I think it is safe treatment to limit the ingestion in cases with edema, although Fischer advocates free salts, free fluids and free alkali. . . . If the patient is obese, his weight should be reduced to normal, in order to relieve his heart of unnecessary work. If he is thin and anemic, it may be well to put on a little weight. The weight may be easily controlled by regulation of the fat and carbohydrate intake."

"*Obesity and heart disease.* If the patient with heart disease is fifty pounds overweight, he throws a tremendous amount of extra and unnecessary work on his already-overworked heart. . . . Such patients should be reduced to normal weight, or even slightly below normal. The treatment should be almost entirely dietetic. Exercise is reduced to a minimum until the heart is compensated, and then very gradually increased. Care should be taken to include sufficient protein in the diet to avoid wasting of the body tissues with resulting weakness, and the weight should not be dropped too rapidly, an average of two pounds weekly being fast enough. . . . It is possible to reduce weight with the greatest ease by limiting the ingestion of fats, sweets, and high-percentage starch foods, and teaching the patient to substitute potato and other vegetables for bread, and to use fruit and salads for sweet deserts.''

In the treatment of diabetes, Preble finds the Allen starvation treatment a distinct addition to our armanentarium. F. Nicholson[4] objects to the name ''starvation treatment'' as one that does not commend itself (under that name) to the patient. He would prefer to call it the alimentary rest scheme, in which he gives the patient nothing but four half pints of black coffee in the twenty-four hours for from three to five days. By that time the sugar has disappeared entirely from the urine. He then gradually adds cabbage 5 ounces, and in a day or two an egg, and then one-half a pint of beef tea, increasing it each day or two, provided no sugar appears, until in ten or fifteen days the patient is getting: meat 2 ounces, casein 2 ounces, cream 2 ounces, beef tea 1 pint, cabbage or other green vegetable 10 ounces, 3 eggs, tea or coffee 2 pints, with cream and some peanut butter with bread. Nicholson gives the following formula for a bread substitute, that has the advantages that it is almost free from starch, can be made at home, is inexpensive, palatable, and can be cut into thin slices:

Pea-nut flour	8 oz.
Casein	2 oz.
A pinch of salt.	
White of egg	12 oz.

The white of egg is beaten to a snow; then the other ingredients (previously lightly mixed) are slowly added. The dough is put in a tin and baked in an oven.

If desired, the yolk of the eggs may also be used, and then only half the number of eggs is required; but the bread is yellow and it is not quite so nice. Almond flour may be used instead of pea-nut flour, but it is more expensive.

To Antagonize Intestinal Putrefaction. Lactose rather than lactic acid bacilli should be used for this purpose, since Hull and Rettger's[5] experiments on the ''Influence of Milk on Intestinal Flora'' have shown that, while it is impossible to acclimatize *B. bulgaricus,*

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(4) Brit. Med. Jour., Jan. 20, 1917.
(5) Jour. Bacteriol., January, 1917.

and other foreign bacteria in the intestine by administration of the bacterial cultures, it is easy to change the intestinal flora by diet. Their experiments were performed chiefly on white rats; but a few were also carried on in man. They found that, by giving from 300 to 400 gm. of milk sugar daily, they were able to produce a marked change in the intestinal flora within a few days, the lactic acid bacilli, *B. acidophilus* and *B. bifidus,* becoming dominant. The change was accelerated by use of a laxative. Milk alone does not produce this change as readily, as when milk sugar is added to it. The effect is due to the comparatively slow absorption of milk sugar, which serves as a better culture medium for the lactic acid bacilli than for others. It does not depend upon the development of lactic acid, for the acidity was not higher in the intestine of rats fed on milk sugar than it was in others.

Meat and other high protein diet increased the development of indol-producing bacteria and of other organisms of the so-called "putrefactive" type, like *B. coli* and *B. welchii.* Liberal feedings, on the other hand, of *B. coli* did not bring about a perceptible increase in the numbers of this organism.

While these results do not agree with those of Metchnikoff and his followers, who claimed that ingestion of *B. bulgaricus* brings about its implantation in the intestine, the authors quote other observers whose findings harmonize with theirs.

Milk Diet. Large quantities of milk are used by J. E. Crewe[6] in quite a number of different diseases with great satisfaction. Perhaps the best results are seen in tuberculosis. Very interesting results have also been obtained in arteriosclerosis, with satisfactory reduction of blood-pressure. The results in chronic nephritis are remarkable, the patient gaining rapidly in weight and the albuminuria frequently disappearing in ten days. Patients with functional nervous troubles, as well as ordinary "run down" patients are always improved. Nearly every patient having chronic constipation has been greatly improved.

"As a general thing we begin the treatment by giving

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(6) Journal-Lancet, Dec. 1, 1916.

the patient large quantities of water and oranges or orange juice, without other food, for one or two days. Following this the patient is confined strictly to bed, but is allowed to walk to the bath room when necessary, unless this is contraindicated. In most instances, the daily feeding begins with three or four quarts of milk, given half-hourly, thirty-two times a day. We begin at 6 a. m. and continue half-hourly feedings until 9:30 p. m. A daily enema of soap water or salt solution is important, because patients to whom it is not given frequently have gas distention and nausea, and develop an aversion to milk. In addition to milk the patients are allowed a dish of prunes or orange juice daily. No other food or water is given. We plan to increase the amount of milk given one quart every other day until we have reached the amount the patient can take, which in most cases is from six to eight quarts. I have had one patient who drank twelve quarts of sweet milk and three quarts of buttermilk a day for two weeks, during which time he gained twenty pounds. I have had patients gain twenty pounds in two weeks on eight quarts a day. We use Guernsey or Holstein milk according to the case, and sometimes give part buttermilk. I am convinced that, to obtain the best results, whole raw milk must be given in large amounts combined with complete rest and hot baths. Unless contraindicated each patient is given a hot bath daily, lasting from ten minutes to three-fourths of an hour, and then wrapped in a blanket to cause perspiration. It is a curious fact that while thin people gain rapidly in weight, stout people gain very little, though they seem to improve equally well. Many patients will be troubled with gas, and a few with nausea and vomiting. We pay no attention to this, but keep on giving the full amount of milk and even increasing the amount. It is surprising how these troubles can be overcome by not "babying" the stomach; however, it requires perseverance and faith on the part of the patient and attendant. . . . Failure to persist will mean failure to secure results."

The author believes that the results of this treatment are not merely due to building up and washing of the tissues; but that raw milk contains some substances, possibly vitamins, that have a powerful effect upon metabolism.

Restricted Milk Diet for the Removal of Dropsies. N. S. Davis[7] gives, in the average case of dropsy of cardiac or renal origin, one glassful (250 ml.) of milk at 7 a. m., 10 a. m., 1 p. m., 4 p. m., 7 p. m., and 10 p. m., and at first nothing else. When patients believe milk disagrees with them or they dislike it, a tolerance of it can be acquired by giving from two to four tablespoonfuls (one to two ounces) every hour. When the taste of milk is more or less unpleasant to them, often they will take one part of cream and one part of Seltzer water instead of milk, with comfort. Not more than a total of six glasses of fluid is given in the twenty-four hours. Six glasses of milk furnish only about 900 to 1,000 calories; hence an insufficient diet for a man and should not be maintained long. Cream and seltzer would furnish approximately 1,400 calories. If the patient is very feeble, six glasses of equal parts of milk and cream might be given, furnishing approximately 1,850 calories, which is almost sufficient caloric income for a patient lying quietly in bed.

By the end of a week in most cases there is marked improvement. Davis then prescribes fruit, in addition, fresh or preserved; though fresh fruit is to be preferred. While it adds but little to the caloric income of the patient, it is greatly relished, and makes the continuous administration of a salt-poor diet possible. At the end of ten days or two weeks improvement is usually sufficiently well marked to make the addition of other food permissible, but the amount of fluid should not be increased. If the condition of the kidneys permits, one or two eggs, boiled or poached, can be given, or farinaceous foods, such as rice, corn-meal or cornstarch or farina or spaghetti, or bread, but these foods should not contain salt or only a minimal amount. Ice cream is often relished, and may be substituted for milk. Sugar and candies and fruit jellies are unobjectionable, provided the patient's digestion is good enough to manage them.

"The quantity of food and especially of fluid should

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(7) Illinois Med. Jour., December, 1916.

be kept small until dropsy is gone and has been undemonstrable for a week at least, then foods may be gradually varied still more and increased in quantity, but patients should be taught to maintain an abstemious diet for a long time.

"It is as important for the patient to keep quiet in bed or on a couch as to have their diet rightly prescribed. . . . Rest in bed should be persevered with until there has been no edema for several days and until the heart is nearly or quite normal in rate. When sitting up and moving about is permitted, it should at first be for a short time only and, if the edema does not return, gradually for longer times."

To provoke free elimination of fluid, purgatives are, with rare exceptions all that is needed. Elaterium (Clutterbucks), given in doses of 0.015 gm. night and morning at first and afterwards at night only usually answers best. Salines are not so good. When he gives elaterium at night, he combines it with 0.1 to 0.2 gm. of chloretone, partly for its local anesthetic properties to lessen irritability of the stomach, and partly to insure sleep. Diaphoresis is rarely needed unless there is threatening uremia. Alkaline diuretics do not do much good, until the anasarca has been lessened by other means. When they are given, the total quantity of fluid allowed should not be increased.

"When the heart is fast and weak or irregular, digitalis, strophanthus, theobromine sodio-salicylate and allied cardiac tonics and diuretics can be used to advantage. While in the treatment of these cases drugs are often needed, without a suitable restriction of diet frequently they will not eliminate the dropsy."

HYDROTHERAPY AND BALNEOTHERAPY.

"American Balneology." Now that the European bathing resorts are practically inaccessible to the American invalids, who were wont to spend millions in Europe in search of health, it is but natural that the study of American balneology should receive a new impulse. A series of articles on this subject by F. von Oefele[8] seems

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(8) Buffalo Med. Jour., October and November, 1916; January and February, 1917.

timely indeed. In his foreword he states that the American physician is less acquainted with the American mineral springs than with the European ones. This is due to various causes, among which probably the most important is the fact that European springs with an old history are owned by states or townships, while the majority of American mineral springs are still privately owned, with the result that there exists neither a scientific standard nor a critical view in the recommendation of American springs. Furthermore, scientific medicine is too little interested in balneology.

[The article does not lend itself to abstracting. It chiefly consists of a collection of data. Its purpose to stimulate interest in American balneology is a most commendable one.—Ed.]

"Hydrology in Military Practice." This is another article with a similar message, by G. Hinsdale,[9] which brings out the fact that the Surgeon-General of the United States Army has not yet taken up the question of utilization of our mineral springs resources for the benefit of invalidated soldiers. This has been done by France as well as by Great Britain; and it seems desirable that it be done in this country.

[Comparative and critical studies of results at mineral spring resorts by our military medical authorities would be an important step in the right direction. The more general utilization of our natural healing resources might furthermore be advanced by the establishment of a department for the "Scientific Study of American Balneology" by the American Medical Association. The institution, furthermore, of vacation trips to health resorts by physicians, which were quite popular in Germany, would also be of value to acquaint our medical men with these therapeutic potencies.—Ed.]

Bath Exercises. These are recommended by C. Ogilvy[1] in the treatment of the later stages of anterior poliomyelitis. He uses them both for examination and for muscle training. In a bath, the slightest response of returning power in a muscle or group of muscles can be detected and recorded. In addition to this, the

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(9) Med. Record, Oct. 28, 1916.
(1) Jour. Amer. Med. Ass'n., Sept. 1, 1917.

patient is encouraged to attempt and obtain motion which would otherwise be impossible—and this without the slightest over-fatigue. He had installed at his clinic a bath 4 feet by 3 feet in size.

Ogilvy also announces the following conclusions:

"Complete rest extending over six months is one of the most important factors in obtaining perfect return of function. Over-fatigue is of the greatest detriment to improvement, and is most difficult to guard against. Braces should be made as light as possible and should be applied immediately when body weight-bearing tends to produce strain or deformity. Continuous electric treatment is not essential for the recovery of lost muscle function."

The Whirlpool Bath. *"Eau Courante"* consists, according to F. P. Nunneley,[2] of water as hot as can be borne (110° to 120° F.) forced by means of a motor to rush through the bath cylinder, producing a whirlpool. Very shortly after the limb has been immersed in the bath the skin becomes flushed, and pain is relieved; and movements can be made that previously were painful or impossible. After the bath, the tissues of the limb are hyperemic, soft and relaxed, and will bear manipulation that before the bath would have been too painful. It has proved itself superior to radiant heat as a preliminary to massage. In cases in which the use of hand massage is contraindicated by the danger of disturbing the barriers erected by Nature against the spread of infection, the whirlpool bath is of considerable value. It not only induces an increased flow of blood by its thermal qualities, but also facilitates resolution and removal of inflammatory products by the massage of the rapidly moving water. When nerves in a wound have been slightly injured, the application of heat is likely to increase the pain, while massage is intolerable. In such cases, the whirlpool bath at neutral temperature relieves pain and gives a sort of massage substitute. The pain referred to the missing hand or foot, so frequently felt after amputation, is rapidly relieved by the whirlpool bath, especially if one of the jets is permitted to play directly on the tissues covering the nerve which is

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(2) Brit. Med. Jour., Nov. 25, 1916.

apparently at fault. It is suggested that this treatment might be of value in recent wounds, especially those associated with large sloughing areas.

The Continuous Bath. This is highly lauded for its efficiency in calming agitated patients, and considered of great value in the treatment of mental disease by E. A. Strecker.[3] Probably the best results were obtained in conditions of confusion and restlessness, associated with considerable physical debility, as in the infective-exhaustive group. The manic type of manic-depressive insanity responds to the continuous bath in something more than half of all cases. In dementia praecox, for the relief of episodic excitement and to combat various vasomotor disturbances, these baths have been found beneficial. It is also likely to be found useful in the treatment of delirium tremens. Patients suffering from apprehension dictated by delusions are likely to be made worse by these baths.

The continuous bath acts as a mild hypnotic agent, without the sacrifice of mental capacity or marked modification of any of the bodily functions, excepting probably a stimulation of the excretory function of skin and kidney. They have the advantage over hypnotic drugs that they do not introduce an additional intoxication into the system; and over moist packs that they offer no resistance to the motor restlessness, which so often accompanies the apprehensive confusional state. In the baths the destructive tendencies of maniacal patients are checked, and the distressing untidiness of these patients becomes a much less serious factor.

The author advises that these baths should be set up in a practically sound proof room, and that it would be well to pay more attention to the esthetic features, such as furnishing of the room and pictures on the wall. There is a distinct need for more individual bathrooms. When a somnolent state is reached, transference of the patient to bed is desirable. No restraint is necessary, and to use it is to defeat the purpose for which the bath is given. If mechanical means are required to keep the patient in the tub, resort to some other form of treatment is desirable.

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(3) Jour. Amer. Med. Ass'n., June 16, 1917.

[The continuous bath is also highly valuable for the treatment of extensive skin eruptions and burns, and for the constant removal of profuse discharges from large abscess cavities.—ED.]

Local Applications of Cold and of Heat to the Interior of the Abdomen. Such applications produced a marked fall of blood-pressure in the anesthetized cats upon whom F. S. Hammett[4] and his associates experimented, due apparently to vasodilatation from stimulation of the splanchnic nerves. They therefore warn surgeons against such measures, as they might increase an existing depression of blood-pressure to a dangerous degree. They find, on the other hand, that the application of heat to the exterior of the abdomen causes a rise in blood-pressure, which might be of therapeutic value. Cold applied to the surface of the abdomen produces little effect.

[It would be of interest to test these last two propositions upon unanesthetized human beings; and this could most satisfactorily be done by the Editor's method of continuous blood-pressure registration in the human, published in the *Journal of the American Medical Association,* June 16, 1917, p. 1807.—ED.]

ELECTROTHERAPEUTICS.

A Plea for More General Interest in Electrotherapeutics. This appeal is made by W. L. Clark,[5] who blames the slow progress made in this field to the teaching that electricity is purely psychic in its action, to erroneous statements contained in text-books, to absence of even rudimentary teaching in medical schools, to irregular pseudo-scientific and uncritical use, and to lack of proper standardization of apparatus. He believes that an unbiased study of the subject is a duty all physicians owe both to themselves and to their patients. Electrotherapeutic teaching should be introduced in all medical schools, and laboratories for research installed.

After discussing the remedial possibilities of electric-

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(4) Jour. Amer. Med. Ass'n., Feb. 24, 1917.
(5) New York Med. Jour., May 26, 1917.

ity in a general way, he points out some fallacious teaching, as follows:

1. The belief that the galvanic current does not penetrate into the deep tissues, is an erroneous one. While the skin is a poor conductor, the deeper tissues conduct well. Living bone is a much better conductor than the skin. The brain is acted upon perhaps more freely than any other tissues, because it is such a good conductor.

2. That high-frequency currents produce "fine cellular massage" and various other mystical effects is also erroneous. There is no present evidence to show that there is any other action than that of heat, but it may be truthfully said that for the superficial or deep application of heat with its known benefits high-frequency currents hold first place.

3. Ultraviolet rays are not obtainable from high-frequency glass vacuum electrodes, for these rays will not penetrate glass. Quartz mercury-vapor lamps are the best means of producing these rays. [See also p. 54.]

4. Acute neuritis should not be treated by physical contractions produced by the static wave current or static sparks. Absolute rest and immobility are the first indications. In addition, heat from electrical sources such as high-frequency currents and therapeutic lamps, or mild positive galvanism to lessen nerve irritability, may be used to advantage. During the subacute and chronic stages, the static wave current and static sparks, together with diathermy, may be used, and will not only give relief, but also materially hasten the cure. Where pus is present, electrical contractions are always contraindicated, while high-frequency currents, ultraviolet rays, and radiant light and heat may be used to advantage.

5. Another error is the assertion of the reduction to normal size of large fibrous prostates. Relief has been obtained in such cases from the static wave current by improvement of the local circulation. When this does not suffice, the Roentgen rays may produce benefit as in case of uterine fibroids. But, if neither of these produce the desired relief, prostatectomy is the only means of escaping permanent catheter life.

6. The static positive and negative pole cannot be

used interchangeably; sedative or irritant effects depend upon the polarity.

7. So-called ozone therapy has been a fruitful field for charlatans. Ozone is irritating to mucous membranes, and so unstable that it forms chemical combinations before reaching its destination. Beneficial effects may be obtained from the volatile oils through which the ozone is passed in some apparatus. [See also p. 46.]

8. Extravagant and ridiculous claims have been made regarding the benefit from electrotherapy in incurable diseases.

9. Autocondensation is a valuable adjunct to other means of treatment employed for the reduction of high blood-pressure. The static wave current raises blood-pressure.

The value of the electric current in diagnosis and prognosis should be remembered.

Contraindications to the Use of High-Frequency Currents. The following contraindications are given by F. de Kraft.[5]

As every diathermic application produces arterial hyperemia, it is distinctly contraindicated in all conditions where a tendency to hemorrhage exists, nor is it wise to use such treatment during menstruation or pregnancy.

Suppurations, so long as they are walled-in by surrounding structures, should not be subjected to this treatment as it might stimulate the formation of pus. Hence it is highly improper to apply diathermy to boils and carbuncles, or to the frontal sinus, antrum of Highmore, middle-ear, gall-bladder or appendix, when these organs are acutely inflamed and pus might be present.

Diathermy is distinctly detrimental in acute articular rheumatism. A decided aggravation of conditions is liable to occur. Salicylic ionization is a method of great value. Nor are all cases of gonorrheal arthritis favorably influenced by local diathermy; some are even made worse temporarily. Radiant light and heat applied subsequently to the diathermy are generally quite useful. Gouty attacks, though they are generally aborted by a

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(5) New York Med. Jour., April 7, 1917.

few applications, are sometimes aggravated in painfulness by any degree of diathermy.

As a rule, the use of the diathermic method is not advisable in the treatment of tuberculous glands. The application of Roentgen rays seems the more rational method.

As diathermy, not only produces hyperemia, but also stimulates cell function and gland secretion, it would be improper to employ it in hyperthyroidism. Roentgen rays, having exactly the opposite effects on secretions, are here the more appropriate remedy. For the same reason, Roentgen rays should be preferred in the treatment of glandular swellings, such as those of Hodgkin's disease, leukemia, etc.

There are some obesity patients, whose weight is increased surprisingly by mild applications of high-frequency currents.

"Rise in blood-pressure frequently results from an ordinary autocondensation, with moderate amperage, in cases of disease of the blood glandular organs. Currents of large amperage of longer duration, usually lower the pressure in these cases, for the time being. The patient, however, is not benefited thereby. Faintness, cold, drenching sweats, nervousness, great shortness of breath, sleeplessness, and muscular soreness may result from such an application in cases of this class. If this happens, it will be days before the unfortunate effect disappears. It is better to apply the current directly to the organ which is the cause of this high blood-pressure. For instance, the kidney in chronic nephritis, or the heart in chronic myocarditis should be diathermatized. No matter what organ or part we wish to treat, in a case of parenchymatous nephritis, as little general diffusion of the current as possible should be permitted. These patients can receive a great deal of comfort and help by strictly localized diathermy, but they can also be made miserable by general application. In advanced arteriosclerosis, great care should be exercised. . . . Gentleness and great moderation of these powerful agents should be the rule in treating old people."

[It is refreshing to find contraindications dwelt upon in a field where the making of excessive claims has been the rule.—ED.]

Iontophoresis in Ophthalmology. This subject is discussed by F. Stocker.[6] He finds zinc iontophoresis of the greatest value in infectious processes of the cornea, be this due to pneumococcus, diplobacillus, or aspergillus fumigatus. Even in interlamellar corneal abscess it is a reliable remedy. Since October, 1910, he has treated 123 cases of *"ulcus serpens cum hypopio,"* in none of which zinc iontophoresis disappointed him. During this time eighteen cases of interlamellar corneal abscess were treated in this manner. The local infectious process healed in all of them; four eyes, however, were lost subsequently, owing to development of irido-chorio-cyclitis. The infection had evidently penetrated too deeply.

The action of zinc iontophoresis is a double one: in the first place, is the zinc ion bactericidal, as can be shown experimentally and clinically; and, secondly, it exerts a trophic stimulus upon the healthy tissue. It is perhaps the latter action that is the most important; and that makes this procedure also of use to stimulate the healing of non-infected corneal herpes. This treatment has also been found of value in eczema of the cornea, and in that of large phlyctenulae, as well as of blepharitis ulcerosa.

Copper iontophoresis has been found useful in chronic conjunctivitis and in trachoma.

The technique is described in detail in the original article, to which those interested must be referred.

Suppurative Processes Favorably Influenced by Zinc Iontophoresis. This is the opinion of H. Koller.[7] Its action is similar to that of zinc solution, only more intense. The application of most other basic or acid ions by this method does not seem very promising of practical results, as we have other methods that admit of simpler application, more rapid absorption, and more precise dosage.

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(6) Cor.-Bl. f. Schweiz. Aertze, Jan. 27, 1917.
(7) Cor.-Bl. f. Schweiz. Aertze, April 21, 1917.

RADIOTHERAPY.[1]

Comparison of the Action of Radium and of Roentgen Rays in Superficial Cancer and Skin Disease. F. E. Simpson[2] states that there is a difference in the effects of the two, but that they both produce two results in common on living tissues, a selective and an inflammatory action. The selective action is a retrogressive change occurring without macroscopic signs. Each of the two sources of radiant energy has its own field, but often they can be used together to advantage. Excellent results from the treatment with radium of epithelioma of the skin and mucous surfaces are reported. Successes are also recorded in the treatment of vascular nevi, keloids, lupus erythematosus, sycosis vulgaris, lichenification of the skin, and in pruritus. Tuberculosis verrucosa cutis usually does well, but lupus is often refractory.

Percentage of Cures by Roentgen Rays. A report of the results of Roentgen ray treatment of 530 cases of various lesions about the face and lips, 62 per cent. of which were clinically malignant, is made by H. W. Dachtler,[3] of Toledo. This series of cases covers a period of seventeen years. Carcinoma of the neck is excluded from this list. In the detailed reports, 481 cases are cited, in which cures resulted in 435. Lupus vulgaris did not yield easily, only three cures being accomplished in seven cases. Erythematous lupus gave no results. Keloid, on the other hand, yielded well to persistent treatment, all cases being so much improved as to be classed as cures.

[It is a pity that the malignant lesions were not separated from the others in the report. This would have made it much more impressive.—ED.]

Treatment of Nevi. That all birth marks should be treated as soon after birth as possible is the advice of W. S. Newcomet,[4] of Philadelphia. He refers not only to the vascular form, but to moles as well because of their occasional malignant degeneration. The cavernous nevi covered with normal skin are the most easily cured, he says, and advises for them electrolysis or diathermy. When the skin is involved, radium gives the best results. Ultra-violet light is also recommended. Radium or Roentgen rays are most satisfactory for the treatment of the pigmented nevi.

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[1] With the collaboration of Dr. A. W. Stillians.

(2) Jour. Amer. Med. Ass'n., Nov. 18, 1916.

(3) Rep. Ann. Meeting of Amer. Roentgen Ray Soc.; Jour. Amer. Med. Ass'n., Nov. 4, 1916.

(4) Ibid.

Roentgen Effects Upon Brain Tumors. From Denmark comes a report by S. Nordentoft[5] and O. Gulstad[6] of twelve cases of tumor of the brain treated with Roentgen rays. Two cases were entirely unaffected, but all the others were helped, eight of them considerably. In three cases the success seemed complete, one patient being now well for a year and a half. The greatest improvement was in restoring vision, one case of choked disk of three years standing clearing up. Nordentoft and Gulstad advise a trial of antisyphilitic treatment first, and if that is not successful a trial of Roentgen rays before operation. They believe that the treatment does not injure the brain, and in none of their cases did the hair fail to regrow.

Radium Treatment of Carcinoma of the Bladder and Prostate. In treating carcinoma of the bladder B. S. Barringer[7] places an emanation tube containing 100 to 200 millicuries (equal in strength to 100 to 200 milligrams of radium) and screened by 0.6 mm. silver and 1.5 mm. rubber upon the tumor through the cystoscope and leaves it there for from six to ten hours. The patient's position in bed varies according to the location of the tumor. If at the base of the bladder, he remains upon his back; if at the fundus, the patient lies on his abdomen. In most cases urination is not interferred with, and only in extensive tumors involving the bladder has the effect of the rays upon the sphincter increased pain and frequency of urination. Of sixteen cases treated, thirteen were advanced ones. In spite of this, four patients are cured so far as symptoms and the result of cystoscopy can say, one of them for ten and a half months, one for five months, and two recently.

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(5) Ugeskr. f. Læger., Vol. 79, 1917.
(6) Ibid.
(7) Jour. Amer. Med. Ass'n., April 28, 1917.

Only one of these was an early case. Five patients have died and three are getting worse.

Carcinoma of the prostate was treated by Barringer[8] by the insertion into the tumor through the perineum of emanation needles containing 50 to 100 millicuries and allowing them to remain for four to six hours. The needle causes little pain, and the full effect of the nearly unscreened rays is exerted directly upon the tumor tissue. Seventeen cases have been treated. Of these eight were advanced cases, hopeless according to former ideas. Two of these patients have died and two more are growing worse. One was working seven months after a single treatment and has now been lost track of. Three are improved in general health and in the local signs and symptoms.

Of the nine cases that are classed as fairly early, five have been treated too recently to judge of the effects. Of the other four all have improved as to the prostate, and three patients are better in every way. The fourth has been held back by retention of urine, and has had to have the prostate removed.

So well satisfied is Barringer with the results in these cases that he maintains that no prostatic carcinoma should be operated. To cure carcinoma of the bladder it is necessary only to get the cases early enough and to apply the radium directly to the tumor.

[The author evidently uses radium emanation instead of radium itself, as the title and text of his articles state, for he expresses his dosage in millicuries, and the tubes and needles used were too small to contain the corresponding amount of radium salt.—Ed.]

Combined Methods of Treatment of Malignant Tumors. G. E. Pfahler[9] of Philadelphia prefaces his report on malignant tumors about the mouth with a plea for more diligent and careful prophylaxis of malignant growths in this region by the removal of jagged teeth and the treatment of pyorrhea and leukoplakia. If these lesions do not yield to treatment within a reasonable time, and especially if they become thickened or fissured they should be destroyed. Ulcers in the mouths of

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(8) Ibid., Nov. 11, 1916.

(9) Jour. Amer. Med. Ass'n., Nov. 18, 1916.

syphilitics should be held under the same suspicious surveillance, and likewise ulcers, fissures, crusts or warts on the lower lip or at the angle of the mouth. Removal of sections for microscopic study in any suspicious case must be followed immediately by destruction of the whole lesion.

No single method is sufficient for the treatment of malignant disease. Four methods are applicable to these tumors about the mouth: excision, electrothermic coagulation, deep Roentgen therapy and radium applied within the mouth. Pfahler favors electrothermic coagulation for destruction of local tumors, excision for all palpable glands, and radiotherapy following every operation. Electrothermic coagulation excels the electric thermocautery in that while the actual tumor is destroyed, an outlying area can be given enough heat to destroy tumor cells without injury to normal cells. He warns that failure to destroy the whole tumor may result in rapid extension at the border, probably from stimulation by the congestion of reaction. This extension, however, may be prevented by the radiotherapy.

Of eight cases of primary epithelioma of the lip treated by Roentgen rays alone, seven were cured and the patients have remained well for from a few months to eight years. Fifteen such cases treated by electrothermic coagulation have all been well for from a few months up to seven years. Four patients treated by surgery and Roentgen rays are all well and have been so from two to thirteen years.

Three cases of local recurrences after excision were cleared up by Roentgen rays and the patients have remained well for several years. One of these had a metastasis under the chin which also cleared up on radiotherapy and has been well seven years.

Of six cases of epithelioma involving the dorsum of the tongue four recoveries are recorded lasting from one to four years. Epithelioma under the tongue involving the floor of the mouth was represented by six cases, all extensively involved. Electrothermic coagulation followed by deep Roentgen therapy succeeded only in temporary recovery. Three patients have died and three are still under treatment.

Epithelioma of the cheek without palpable glands has done well under the combined treatment. Of three patients two have been well for two and three years respectively and one is still under treatment.

Primary carcinoma of the cheek, gums, jaw bone and submaxillary glands were represented by nine cases. In this class eight successes are reported in detail, lasting from a few months to four years. Three or four patients with epithelioma of the tonsil have been well for from a few months to four years.

Sarcoma of the mouth also yielded well to radiotherapy, in ten of the eleven cases reported the patients being either well or improving. The case in which a failure is recorded was recurrent after operation. The case detailed in the report was a sarcoma involving the whole right lower jaw and part of the upper, with absorption of the lime salts as shown by the Roentgen rays, and the soft tissues into the temporal region. Under radiotherapy alone there has been a clinical cure with almost complete recalcification of the bone.

His conclusions are worthy of attention:

"1. The cases forming the basis of this report, excepting those involving the lower lip, were almost entirely inoperable, and therefore every success is a distinct advance and every failure only a loss of time, energy and effort.

"2. Any lesion about the mouth which does not show a tendency to heal within a few weeks should be looked on with suspicion of being malignant, and in case of doubt should be destroyed or removed.

"3. I believe that early lesions about the mouth can be destroyed by electrothermic coagulation with less loss of tissue and more success than by any other means.

"4. Deep Roentgenotherapy should be added to any other method of destruction or removal of malignant disease.

"5. Combined treatment by surgery, electrothermic coagulation, radium and Roentgenotherapy will cure some patients who are otherwise hopeless."

Tumors of the Tonsils Treated by Radium. Excellent results were obtained by Lannois, Nogier and Sargnon[1] in the treatment of three cases of inoperable tumor of the tonsil by radium. In the first case, an inoperable neoplasm of the tonsil with involvement of the cervical lymph glands, the patient received 1375 milligram hours of radium bromide (about half this dose, reckoned in radium element.) The radium was screened with 0.5 mm. platinum and a rubber drainage tube, thickness not mentioned. Several deep Roentgen ray exposures on the neck were given, and both throat and neck lesions cleared up completely.

The second case was clinically a sarcoma of the left tonsil about as large as a pigeons egg. The same dose of radium was given, and in two days the tumor had decreased to half the size. Less than six weeks after the treatment, the patient, a woman 68 years old, came back for examination with a throat normal except for slight redness of the mucous membrane. The general condition was greatly improved, the former cachexia having disappeared.

The third case was a large growth involving both tonsils, interferring with swallowing and with breathing. There were enlarged lymph glands on both sides of the neck. Radium was applied in half the above dose to either tonsil, filtered only by 0.5 mm. platinum. Reaction was prompt and severe, but the clearing up of the mass of tumor was also prompt. Deep Roentgen therapy was applied to the neck, resulting in disappearance of the enlarged glands. Attention is called by one of the authors (Nogier) to the necessity of combining radium therapy for local effect with Roentgen treatment for deep effect.

X-Ray Therapy of Uterine Cancer. Conservative gynecologists state, says E. H. Grubbe,[2] that only about 50 per cent. of the uterine cancer cases come to the surgeon early enough for the operation to be undertaken advantageously, and of the operable cases only 50 per cent. are even symptomatically cured by the knife and actual cautery. It seems, then, that surgery needs assistance. The *x*-rays aid surgery. It should be assumed in every case that the cancer will return, and no

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(1) Lyon méd., September, 1916.
(2) Interstate Med. Jour., 1917, vol. 24, p. 495.

exception should be made to the rule that all operated cases receive *x*-rays as a prophylactic against recurrence. Even inoperable cases can be benefited and sometimes symptomatically cured.

Post-Operative X-Ray Treatment in Malignant Growths. Has It Established Its Value? A plea for energetic radiotherapy in connection with other treatment of malignant tumors is made by M. W. Johns,[3] of Utica, N. Y. In support of this plea he cites three representative cases. The first was a carcinoma of the cervix not operated and treated with insufficient *x*-rays. Histologic examination showed that some areas of the tumor had been destroyed, but others had not been affected by the treatment, and at the border were areas in which the tumor cells had been stimulated to more rapid growth. The second was a case of pavement carcinoma of the cervix. This received more thorough treatment than the first case. Histologically examined, most of the tumor had been destroyed, only a few nests of tumor cells remaining unaffected by the rays. The third case was one of adenocarcinoma of the cervic with ulceration. This was curetted and cauterized and then treated by radium and Roentgen rays. Because of the persistence of a small ulcer after this treatment a suspicion of remaining malignancy led to an operation, from which the patient died six days later. Not a trace of malignant tumor tissue could be found on histologic examination.

The opinions of well-known surgeons are cited in support of the argument for the combination of radiotherapy with surgical methods in the treatment of malignant tumors.

Effects of Radium on Tissue Growth in Vitro. F. Prime,[4] exposing tissue growing in artificial media to radium, confirmed the theory advanced by others that the rays have a special effect upon the reproductive function of the cell long before they injure it in other ways. The cells in Prime's experiment, in spite of the loss of ability to propagate themselves, were able to wander out of the area of the culture. This wandering

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(3) Interstate Med. Jour., 1916, p. 143.
(4) Jour. of Cancer Res., 1917, vol. 2, p. 107.

is more active than before the exposure, but the cells do not grow when inoculated into mice. The survival of heart-muscle cells and the cells of the central nervous system after large doses of radium is due probably to the fact that they can function independently of the power to reproduce.

The Changes Occurring in the Blood After Radiation with Mesothorium. A series of cases of pelvic carcinoma under mesothorium treatment was examined systematically by E. Schweitzer[5] for changes in the blood. All the patients had a secondary anemia, and many of them slight leukocytosis and eosinophilia before the treatment was begun. All received large doses, between 900 and 1,500 milligram hours, through a filter of 1.5 mm. brass. All except a few who were moribund at the time of treatment showed, soon after treatment, an increase of hemoglobin and red cells, due probably to the cessation of hemorrhage. The leukocytes, which before treatment averaged 9,000 per cu. mm., increased within a few hours to an average of 12,000. Within twenty-four hours the white count returned to below the level at which it stood before treatment and continued to drop during the following day. Three or four weeks after the first series of treatments, aggregating 2,600 to 4,900 milligram hours, the white cells were still low in number, from 3,000 to 6,000.

Differential counts showed that the initial increase of white cells was due to an increase in the neutrophiles more than enough to offset the loss of lymphocytes and eosinophiles which was noticed immediately after the exposure. The percentages at this stage ranged from 78 to 89 per cent. of neutrophiles and from 5 to 11 per cent. of lymphocytes. Soon the neutrophiles began to diminish in number and the lymphocytes to increase, so that three or four weeks after the first series of exposures the percentage of lymphocytes often exceeded that of the neutrophiles. This abnormal relation of the two chief varieties of white cells was increased by the later series of exposures and lasted for several weeks after the treatment ceased. Schweitzer, of Leipzig, who did this work, believes, however, that the blood disturbance

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(5) Münch. med. Wochenschr., 1916, vol. 63, p. 341.

is of no significance to those who receive the rays for only a limited time, but is of great importance to radiotherapeutists. He believes that the lymphocytes are destroyed in the blood-stream by the direct action of the rays, and that the reaction to this destruction results in the later over-production.

[The lymphocytes of the blood seem to be affected about as easily as lymphocytes in the other tissues, as shown by the melting away of enlarged lymph glands or other lymphatic tissue under radiotherapy.—Ed.]

Remissions in Leukemia Produced by Radium in Cases Completely Resistant to Roentgen Ray and Benzol Treatment. These remissions were obtained by T. Ordway[6] by means of radium applied externally. A nearly normal blood picture, a reduction of spleen and glands, and improvement in the general condition were secured. Remissions lasted for months or years. He believes radium therapy safer and prompter in its beneficial effects than any other treatment.

New Ideas in Roentgen Therapy. A. J. Quimby and W. A. Quimby,[7] of Boston, believe that the general effect on the blood has a great deal to do with the beneficial effects of radiotherapy in leukemia and multiple carcinoma. They explain the leukocytosis resulting from even sharply localized exposures as due to local irritation or traumatism which is increased by the local dilatation of blood-vessels, thus increasing the general reaction. Leukocytosis is also stimulated by the waste products resulting from the destruction of tissue.

They also claim to have made quite a decided advance in Roentgen therapy through the use of high voltages and very hard tubes. By using apparatus giving 80,000 to 100,000 volts they are able to dispense with filters and obtain deep therapeutic effects without injury to the skin. By maintaining a field of very high tension surging current around the tube they believe that most of the danger to operator and patient is removed.

[This theory of the action of radiotherapy does not agree with the results of research upon the acute and chronic effects of the rays upon the blood. In regard

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(6) Boston Med. and Surg. Jour., 1917, vol. 176, p. 490.
(7) New York Med. Jour., Oct. 7, 1916, p. 682.

to the high-tension-current theory, some more definite evidence of its safety should be offered before the discarding of filters is mentioned at all.—ED.]

The Treatment of Uterine Hemorrhage by Radium. H. A. Kelly,[8] of Baltimore, states that radium therapy of hemorrhage not due to malignant tumors is "as simple and safe as a dilatation of the cervix." A sound with a hollow tip containing 500 millicuries of emanation is applied to eight different points in the uterus for fifteen minutes at each point. In young women menstruation can be controlled without stopping it, and fibroids can sometimes be cleared up without stopping menstruation. In one case, pregnancy and a healthy child followed the treatment of excessive menstruation. Many cases too feeble to be operable were treated without any bad effects of the treatment.

In the same symposium at the Annual Meeting of the American Gynecological Society, C. T. Miller,[9] of New Orleans, reported a similar experience. Radium treatment was almost perfect in control of excessive bleeding at the menopause, a single treatment being sufficient. Submucous fibroids, however, large fibroids causing pressure symptoms, or degenerating fibroids, should be operated on. Surgery is also more exact in preserving the generative functions in young women.

J. G. Clark,[1] of Philadelphia, added his testimony to the value of radium in these cases, and said that in over 100 cases he had seen but one failure to relieve the hemorrhage.

Actual Value of Roentgen Rays in Exophthalmic Goiter. In the course of their investigation of the effects of various methods of treatment upon exophthalmic goiter, J. H. Means and J. C. Aub,[2] of the Massachusetts General Hospital, found that large doses of Roentgen rays over the thyroid and thymus once in three weeks had no effect in half of the sixteen cases studied. All the other patients showed an improvement that could be ascribed only to the radiotherapy, and

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(8) Rep. Ann. Meeting Amer. Gynec. Soc., 1917; Jour. Amer. Med. Ass'n., July 14, 1917.

(9) Ibid.

(1) Ibid.

(2) Jour. Amer. Med. Ass'n., July 7, 1917.

several were remarkably benefited. The authors conclude that "complete rest in bed plus irradiation should be continued until the metabolism reaches a level." If rest and Roentgen ray fail to restore the metabolism to within 20 per cent. of the normal, it is proper to resort to surgery unless there is some definite contraindication.

PREVENTIVE MEDICINE.

WILLIAM A. EVANS, M.S., M.D., LLD., P.H.D.

INTRODUCTION.

The war has already profoundly influenced hygiene both abroad and here. As time goes on its influence will be greater still. A year ago compulsory health insurance was the livest of all medical topics. Immediately upon the declaration of war the discussion ceased. The medical mind was too busily occupied with immediate questions to concern itself with the more remote. And yet out of the war there is a rather general consensus of opinion that compulsory health insurance will come. The war has caused postponement of discussion of this very interesting and important question.

Prior to the great war the British Royal Commission on Venereal Disease had begun its hearings. Their report was issued about the time when the military authorities began to complain of the amount of disability that was due to these diseases. It was easy to see that the military could not be properly protected against them unless they were regarded as contagious diseases by the civilian authorities and effort was made to control them. In consequence, a co-operative program supported in part out of national and in part out of local funds is being operated in England, Wales and Scotland. The indications are that local health departments in America will shortly follow the British example. Never before in the history of wars have the military authorities made such strenuous efforts to control venereal diseases. Contrary to the effect of the war on the discussion of health insurance, the discussion of venereal disease has become acute. It is now an immediate question.

The contagiousness of measles is so great that everyone has felt inwardly, whatever he may have said, that once the disease has invaded a community is must be allowed to "burn itself out." It was thought that measles in a training camp especially was uncontrollable. During the year two military commanders have been brought to task for failing to control measles. An accepted authority pronounces it a controllable, preventable disease of the respiratory tract. If this opinion is sustained a new grip on measles among civilians must be the outcome.

The control of pneumonia has made some headway. Its gradual repression begins for the first time to come within the range of the possible.

Epidemic meningitis has never been amenable to civilian control. The English assert that they have controlled it in their navy and army. This information can be made use of by our civilian authorities and by practitioners of medicine as well.

1917 witnessed a few localized epidemics of infantile paralysis. The worst of these occurred in Chicago in September and October. Nothing saved the city from a serious epidemic except the onset of cold weather. My mind is definitely made up as to infantile paralysis. Our present procedures for the control of the disease are ineffective. It is being spread by some channel that is not being watched.

The reports of the almost total suppression of typhoid fever which come from the different armies cannot possibly fail to affect the prevalence of this disease in civilian life. Typhoid rates of 10 to 100 are heathenish in a day when armies living in trenches have rates of less than 1.

The reports from the armies are that the dangers from diseases that are contracted through the gastro-enteric tract are about ended so far as the army is concerned. These reports will affect civilian conditions. Likewise all diseases that can be vaccinated against have been suppressed in armies. In the face of this fact the vaporings of the anti-vaccinationists and others of their ilk can not mould public opinion.

WILLIAM A. EVANS.

PREVENTIVE MEDICINE.

THE PHYSICIAN AND PUBLIC HEALTH BOOK.

HEALTH INSURANCE.

Health Insurance. Burnham[1] says that the rapid spread of workingmen's compensation laws and the economic importance of medical work portends the enactment of laws under which all persons will be treated by physicians in the employ of the state.

A tentative plan to provide for the medical care of the families of an entire community has been formulated by the American Association of Labor Legislation. From the rapid spread of such legislation in Germany, England and other countries of Europe it may be assumed that such laws will soon be enacted in the various states of America. Such laws to be successful must benefit all persons concerned and, therefore, provide maximum benefits to the patient, suitable remuneration to the physician and a minimum expenditure by the state. Such laws are not for the purpose of benefiting the physician or equalizing the differences between employer and employee, but are attempts to place the burden of the results of accidents and ill health upon the community as a whole. The proposed act contains 53 sections, of which the first fifteen are of greatest interest to the medical profession.

Sections 1 to 5 outline the name of the law and designate persons insurable. Compulsory insurance is provided for every person in the state whose remuneration does not exceed $100 a month. Voluntary insurance is provided for others.

Sections 6 to 8 outline the benefits of health insur-

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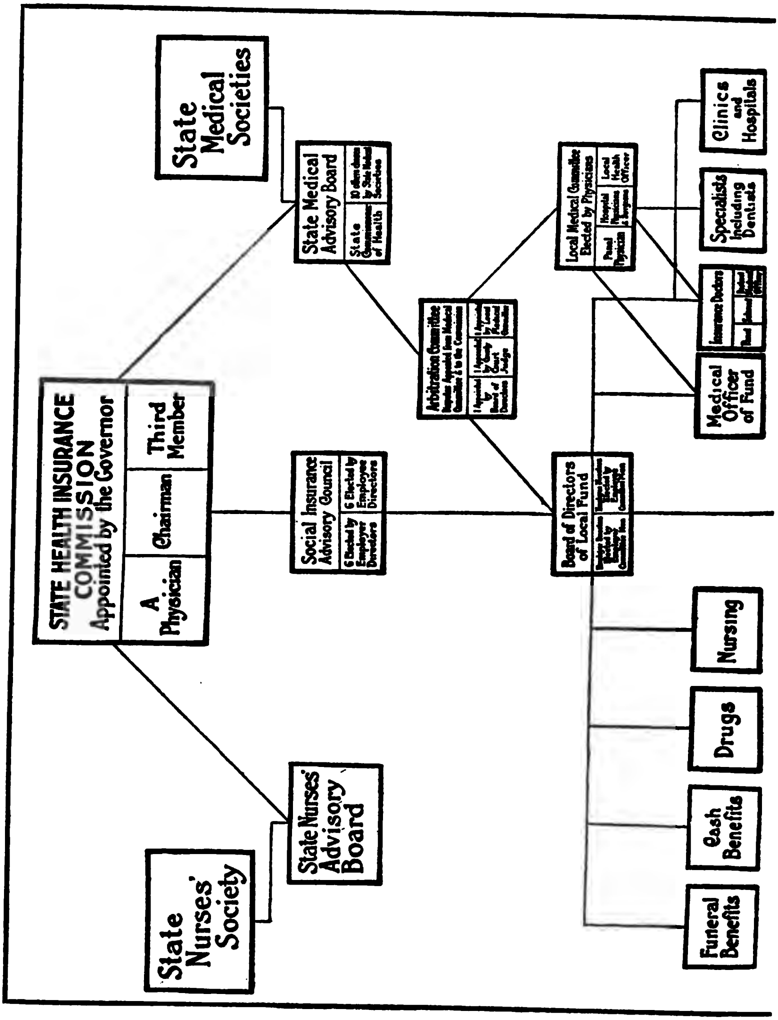
(1) New York Med. Jour., July 12, 1916.


STATE HEALTH INSURANCE COMMISSION Appointed by the Governor
A Physician
Chairman
Third Member
State Medical Societies
State Medical Advisory Board
State Commissioner of Health
10 often chosen by State Medical Societies
Social Insurance Advisory Council
6 Elected by Employer Directors
6 Elected by Employee Directors
State Nurses' Society
State Nurses' Advisory Board
Arbitration Committee
1 Appointed by Board of Directors
1 Appointed by County Court Judge
1 Appointed by Local Medical Committee
Local Medical Committee Elected by Physicians
Panel Physicians
Hospital Physicians & Surgeons
Local Health Officer
Board of Directors of Local Fund
Clinics and Hospitals
Specialists including Dentists
Insurance Doctors
Medical Officer of Fund
Nursing
Drugs
Cash Benefits
Funeral Benefits

ance prescribed as follows: Medical, surgical and nursing service; medicines and surgical supplies; cash benefits; maternity benefits; funeral benefits.

Medical care is provided for the insured under one of three plans:

1. Free choice of physician by the employee, the fee being paid by the insurance carrier.
2. Contract method, the physicians contracting at an annual fee.
3. Method of state control under which the state may appoint panel physicians, either as full-time officers or under a fee system.

The first method (free choice) insures coöperation of physician and patient and the physician's remuneration is usually ample under this system, but it is liable to lead to exploitation of the state.

Under the contract system there

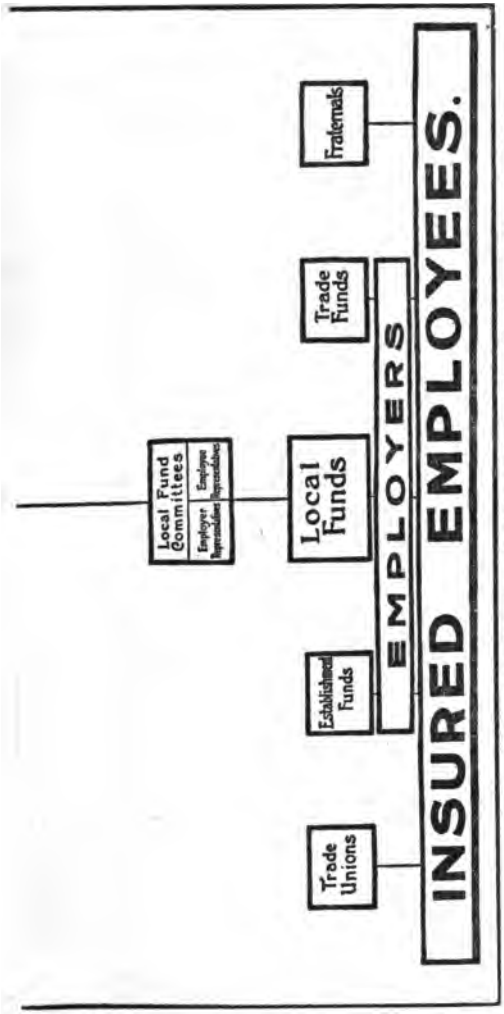


Fig. 10. Plan for the administration of health insurance.

is underbidding by physicians, making fees insufficient for support and fostering neglect of patients by physicians because of excessive demands on their time. England has attempted to correct this system by limiting the number of patients to the physician and establishing a fixed fee. This results in an inelastic system. Patients complain that they are not examined or treated and are charged for other than the medical treatment stipulated by law.

State control is subject to politics, graft and inefficiency. Physicians are selected by state authorities and are responsible to the state. For the systematic care of the industrial population on a large scale, a plan similar to that used by the United States Army is suggested, in which the state is divided into districts with a medical unit having full charge of the insured. Insured would be directed to the headquarters of the medical unit for treatment, where specialists, nurses and equipment are at hand, calls being made by order of the headquarters.

[The subject of health insurance was the livest of all health subjects at the beginning of this year. A tentative bill had been drawn at the suggestion of the American Association for Labor Legislation. It was proposed that this bill should serve as a basis for bills to be introduced into the several legislatures. Two or more legislatures were giving very serious study to health insurance bills, and others were considering bills providing commissions to study the subject. Then the precipitation of war diverted the attention of lawmakers, labor leaders, employers and physicians. The probability is that the subject will not again become alive until after the war has ended. The bill as drawn was based upon the German and English Acts. It proposed to insure all persons earning one hundred dollars a month and less against illness. Other benefits were provided. The bill was only incidentally a preventative medicine measure. The cost of insurance was to be borne jointly by the state, the employers and employees. The scheme of organization and administration proposed by Dr. Alexander Lambert is shown in the accompanying chart. Very elaborate and illuminating reports on the measure were issued by the American Association for Labor Legislation and a committee from the American Medical Association. On the other hand a committee from the Chicago Medical Society issued a report opposing it. No other subject provoked so much medical and medico-sociologic literature during the latter half of 1916 and first part of 1917.

When the excitement of war has passed the subject of health insurance will again come to the fore. At such time the pages of this book will devote considerable space to it; for in my judgment health insurance can be made the most powerful of all governmental agencies for the prevention of disease.—Ed.]

WORK OF HEALTH DEPARTMENTS.

Health Standards for Cities. E. C. Levy[2] proves to our satisfaction that the gross death-rates of a city do not furnish an accurate or even moderately dependable standard for determining the efficacy of its health department, or of its total activities for the prolongation of life and the preservation of health. It is necessary to analyze conditions, taking into account death-rates, morbidity-rates and such other factors as size, area, population, geography and topography of location; industries; character of population, racial, habits and customs, languages spoken, age distribution, stability (immigration, floating population, etc.) and stage of development of health work. Discussing points in some detail, he said climate is of immense importance. Scarlet fever and diphtheria are relatively important in the North and unimportant in the South. Malaria, typhoid and diarrheas are of reverse importance. What can be accomplished with a $1.00 per capita expenditure for health varies according to the class of the city from the standpoint of size. Age distribution is a factor of major importance. "It is utterly misleading to compare a city that has grown by normal excess of births over deaths with one that has grown rapidly by influx of young adults." A large negro population affects adversely the death-rates because of small average wage,

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(2) Jour. Amer. Med. Ass'n., Dec. 9, 1916.

low sanitary and hygienic standards and lower biologic resistance. The negro has come so rapidly from savagery that he knows less about sanitation, cares less about it and, in addition, has not acquired resistance to certain diseases through education of his resisting tissues and through processes of selection.

In the discussion of Levy's paper, I. M. Rubinow said that he thought the economic explanation of higher death-rates among negroes was more important than the biologic. He did not think that biologic differences were important in this case.

The Statistical Method in Health Work. L. I. Dublin[3] in arguing for more accuracy of statement by health departments says that the general public will not support health work or any other social welfare program which is based on snap judgment or upon conclusions drawn from incomplete, biased or otherwise defective statistics. We must continually keep in mind the possible reaction of a community which forgets the urgency and efficacy of health program and remembers only the errors which have already been exposed in the basic data used to support previous health and welfare enterprises.

Shortcomings of Socio-Sanitary Investigation. F. Schneider[4] says that work in this field needs more of the scientific spirit, less assertion and more evidence; less faith and more science. He critically analyzes the report of the Liverpool Housing Commission and finds very little basis for the statements made there as to the improvement in health as a result of the better housing. The improvement may be there but proof of it is not furnished. He studies a certain report on an epidemic of diphtheria. He finds few of the conclusions stated to be founded on facts. More often than not the logic is "*post hoc procter hoc.*" He finds most health department conclusions as to causation are really based on association. He quotes Karl Pearson as follows: "Here we reach the great rule of modern statistics. When investigating the relation of two characters which you find associated, test whether they still remain related after

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(3) Amer. Jour. Pub. Health, January, 1917.
(4) Ibid.

you have given all other characters likely to be influential constant values. Before you have done this you certainly must not treat the relation as a causative one."

Relative Values of Different Health Department Activities. C. V. Chapin[5] gives the following relative values to different municipal public health procedures:

Vital statistics		60
Education		80
Laboratory		50
Control of nostrums		50
Care of sick poor		50
Food...	Adulteration	0
	Sanitation	10
Milk...	Adulteration	3
	Sanitation	17
Nuisances...	Privy Sanitation	60
	Housing	20
	Plumbing	10
	Nuisances	10
	Refuse Removal	0
	Fly and Mosquito Control	10
Infant Mortality...	Nurses	80
	Supervision of Midwives	10
	Babies Boarding Houses	5
	Milk stations	5
	Consultations	20
	Prenatal Clinics	10
School inspection		80
Contagious Diseases..	Home Isolation	100
	Hospitalization	50
	Immunization	50
	Venereal Diseases	20
Tuberculosis....	Nurses	60
	Dispensaries	40
	Hospitalization	40
		1000

A second table shows the relative efficacy of various means of saving life in Providence:

Typhoid fever	10	by direct control
Typhoid fever	50	by privy control
Scarlet fever	60	by direct control
Diphtheria	20	by direct control
Diphtheria	30	by free antitoxin
Diarrhea over 1 year	15	by privy control

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(5) Jour. Amer. Med. Ass'n., July 14, 1917.

INTRODUCTION.

The war has already profoundly influenced hygiene both abroad and here. As time goes on its influence will be greater still. A year ago compulsory health insurance was the livest of all medical topics. Immediately upon the declaration of war the discussion ceased. The medical mind was too busily occupied with immediate questions to concern itself with the more remote. And yet out of the war there is a rather general consensus of opinion that compulsory health insurance will come. The war has caused postponement of discussion of this very interesting and important question.

Prior to the great war the British Royal Commission on Venereal Disease had begun its hearings. Their report was issued about the time when the military authorities began to complain of the amount of disability that was due to these diseases. It was easy to see that the military could not be properly protected against them unless they were regarded as contagious diseases by the civilian authorities and effort was made to control them. In consequence, a co-operative program supported in part out of national and in part out of local funds is being operated in England, Wales and Scotland. The indications are that local health departments in America will shortly follow the British example. Never before in the history of wars have the military authorities made such strenuous efforts to control venereal diseases. Contrary to the effect of the war on the discussion of health insurance, the discussion of venereal disease has become acute. It is now an immediate question.

The contagiousness of measles is so great that everyone has felt inwardly, whatever he may have said, that once the disease has invaded a community is must be allowed to "burn itself out." It was thought that measles in a training camp especially was uncontrollable. During the year two military commanders have been brought

Effect of War on the Work of a Health Department. Hope[4] says that the war has not seriously hampered the work of the health departments in England. The death-rates have not risen materially. In Liverpool nineteen of the twenty-five physicians in the department went away to war; 110 members of the Liverpool Medical Institution had gone at the time of Hope's address. Of the 3,500 men engaged in the maintenance of streets and roads 1,100 enlisted. Over 200 of the department horses were taken for military purposes. One general hospital transferred 2,000 of its beds from the civil to the military department.

The shipping of large numbers of horses through Liverpool added to the difficulties of street cleaning. As many of the trained firemen went to war industrial plants smoked more than previously. The burden of inspection of foods and of shipping was greatly increased. The production of milk was greatly interfered with. Hand in hand with these increased needs it was found that civil governments must get on with less money.

In spite of these difficulties the authorities have managed to keep things decently clean and to prevent the undue spread of contagion. The death-rate of Liverpool in the first year of the war was 17.1, not far from the normal. The prediction that there would be a great number of war babies, the result of illicit intercourse by reason of the debauchery of a great military establishment has not been verified. At the time of writing the predictions of a shortage of food supply had not been verified.

Conservation of Public Health. Chas. Porter[5] says that when the British people were jolted out of complacency by the reverses of the Boer war they adopted school medical inspection and then went back to sleep. The experiences of this war have awakened them to a keen regard for the necessity of conserving health. The present war has already inaugurated or will presently inaugurate the following activities, in some instances, new, and in others an enormous enlargement of previous

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(4) Liverpool Med. and Chirug. Jour., 1916.
(5) Jour. State Med., September, 1917.

activities: Maternity and child-welfare work; venereal disease, prevention and cure; measles, prevention and cure; a ministry of health; centralization of administration.

Strange to say none of the groups who have risen to block the undertaking of new health work have objected to these new activities.

[Perhaps they have seen the light. It is probable, however, that they view the situation as did the counsel of the antivaccinationists in Saginaw, Mich., when virulent smallpox was epidemic in that city. The mayor had issued a compulsory vaccination order. The antivaccinationists went to their counsel to have him enjoin the order. The learned lawyer and astute citizen said: "Legally, you are right. The order is illegal and the officers can be enjoined from enforcing it. But this people are in no mood to be trifled with. This community is paralyzed by this epidemic. People are dying, scores are sick. My advice is that you go home and forget the technical rights given you by the law."—Ed.]

Laboratory Work in South Carolina. Coward[6] says that in South Carolina the laboratory of the State Board of Health during about six months of 1916 did 1,200 Wassermann tests. Their force consists of two men and a porter. This force can do fifty Wassermann tests a day, and at the same time prepare and send out 300 Pasteur treatments for rabies *per annum* and do 6,000 ordinary diagnostic tests annually. About 1 per cent of specimens are unfit for examination when received; 25 per cent of the specimens examined gave positive reactions. The service is free.

Mental Hygiene in a Properly Organized Health Department. Rosanoff[7] advocates registering all cases of social maladaptation which come to public or official notice in the following places:

1. Public and private hospitals for the insane.
2. Institutions for inebriates, epileptics and feebleminded.
3. Institutions for criminals, including those for violators of local laws and ordinances.

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(6) Southern Med. Jour., April, 1917.
(7) Amer. Jour. Pub. Health, December, 1916.

4. Courts—especially those trying divorce cases, domestic relations courts, courts for regulation of sexual immorality.
5. Almshouses.
6. Private and public charitable organizations.
7. Public schools (records of backwardness, truancy and unruliness).
8. Orphanages, children's homes.
9. Private medical offices (records of cases of mental deficiency).

Making use of such registry, a great deal of information could be gathered as to social defectives. A study of the insane in asylums is well enough, but it is not sufficiently comprehensive. The above idea was proposed to Rosanoff by Dublin. Later he found that it was one of the recommendations of the British Royal Commission for the Care and Control of the Feebleminded.

Mullan[8] gives the method employed at immigration stations in listing the mental capacity of immigrants suspected of being insane, feebleminded, etc. In June, July and August, 1916, 30,771 immigrants were inspected at Ellis Island. Of these seventy were found to be feebleminded, one was an imbecile and one an epileptic.

VITAL STATISTICS.

The Birth-Rate and Baby Death-Rate in Paris. Pinard[9] holds that it is as necessary for women to produce babies as it is for them to make cannons and munitions, and that it is as necessary for women to give France babies to win the second war as it is to make munitions to win the first one.

The number of babies born in Paris, August, 1913, to August, 1914, was 48,917. The number from August, 1914, to August, 1915, was 37,085. The number from August, 1915, to August, 1916, was 26,179. The mortality of children under one year of age was 155.1 in 1914; 152 in 1915, and 100 in 1916. The mortality in the first three months of life was 81 in 1914; 74 in 1915, and 74 in 1916. The mortality in the second years of

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(8) Pub. Health Rep., May 18, 1917.
(9) Ann. d'hyg. Pub. et de méd. Legale, February, 1917.

life was 43.5 in 1914; 41.2 in 1915, and 55 in 1916. The increase in the death-rate in the second year of life when the other death-rates of infancy were declining, or nearly so, was due to the prevalence of measles and whooping cough. To prevent this they try to keep from entering children's homes and hospitals any children who have fever or cough.

The mortality from diarrheal diseases has fallen 1.19 per cent. in spite of the war. This Pinard attributes to better protection given mothers before confinement, to more breast feeding and to a better milk supply. He places especial stress upon the necessity of keeping babies separated at all stations until such time as it is certain that none of them bear any contagion. He thinks there should be absolute prohibition of work in factories by all pregnant women and all women with young babies. No mother should be allowed to work in a factory until her baby is six months old.

[A by-effect of this war will be lessened activities of the birth-control propaganda and more attention to genetics. It will be noted that in this report, as in so many others that have appeared during this and other wars, evidence is furnished that war tends to lessen infant mortality rates and contagion morbidity rates up to a certain point.—ED.]

Effect of the War on Birth and Illegitimacy Rates. W. H. Hattie[1] says that the birth-rate of Bavaria was 24 per cent. less in 1915 than in 1913. In Berlin the falling off amounted to 20 per cent; in Vienna to 26 per cent. The mean falling off in ten German and Austrian cities was 27 per cent.

Engel is quoted as saying that the illegitimacy rate in Berlin, Hamburg and Munich increased from 15 per cent. in 1914 to 45 per cent. in 1916. The German government is said to encourage illegitimacy.

In England and Wales the decrease in the birth-rate was less than 8 per cent. in the same years. The mean in nine British cities was 9 per cent.

The illegitimate birth-rate in British cities when properly figured is the lowest on record.

The birth rate of Canada has been increasing slightly

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(1) Pub. Health Jour., October, 1917.

for several years. This increase has kept up since the war began. There has been no increase in the illegitimacy rate.

Vital Statistics from Belgium. W. P. Lucas[2] reports that in July, 1916, the well-to-do and agricultural classes in Belgium were healthy and reasonably well fed. Such deprivation of food as they had had to undergo had been to the benefit of their health. The industrial and minor commercial classes have suffered great hardships. For two years the people in these classes have lived on a diet that was barely above the minimum needed to sustain life and a low-working capacity. The amount of fat *per capita* has been so near the bottom limit that tuberculosis has almost inevitably increased. All forms of tuberculosis have increased in all parts of the kingdom, but especially in Liege and the other industrial cities. The adult consumption rate has increased from 164 to 179. Cases of arrested tuberculosis have become active. Slow, dry forms of tuberculosis have shown a tendency to become febrile and moist in type.

The adult population has lost in weight; 80 per cent. of them have lost from 4½ to 7 pounds each.

Speaking generally, there has been less contagion than in normal times.

The school children have failed to grow, and there is much tuberculosis among them. The Belgian relief commissions are now devoting a good deal of their funds and energy to the feeding of school children.

The birth-rates in different parts of Belgium have fallen from 36 per cent. in Mons to 48 per cent. in Brussels. There has been some increase in rickets; the babies have not grown so rapidly as they should; the percentage of prematurely born children is large and maternal nursing has decreased, but in other details than these the situation is good.

The baby death-rate ranges from 84 to 94 in different cities. There has been a drop of from 5 to 10 per cent. in the different cities as compared with pre-war conditions. The death rate from diarrheal diseases has dropped materially. In Liege the drop is 47 per cent. The saving of baby lives has been due in great part to

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(2) Jour. Amer. Med. Ass'n., Jan. 6, 1917.

service to babies and mothers through maternal canteens. Previous to the war there were two of these. In 1916 there were 329. Over 52,000 babies are being reached through these canteens; 13,000 nursing and expectant mothers are being helped; 25,000 older children are being fed through these and other canteens.

[It is probable that the statements made by Dr. Lucas as to conditions in the first half of 1916 do not even remotely indicate conditions in the latter half of 1917. —Ed.]

Mortality Statistics in Young States. Tuttle,[1] as the result of careful analytical study of vital statistics and other statistical data, concludes:

1. The registration of deaths in the State of Washington is as complete as that in most, if not in any, of the states of the registration area.
2. The low infant mortality rate in Pacific coast states is an absolute fact and not an hallucination of over-zealous health officers.
3. A mortality rate of less than 10 in a young state is entirely right, and when the mortality exceeds 10 in our young states investigation as to the precautions taken for the preservation of the health and lives in such states is entirely in order.
4. Some method should be devised by the United States Census Office whereby reasonably accurate estimates of population may be made in sporadically growing states. The United States Census Office estimates the population of the states and cities in the registration area on the basis of the rate of gain or loss during the preceding ten years. This never gives a figure that is entirely accurate, and in the case of communities where the movement of population is very uneven the figure may be so far wrong that the estimated death-rate will be far from accurate.

Tuttle suggests that within the registration area when the death-rate indicates that the estimate of population is incorrect, the Census Office should conduct an investigation and revise its estimate of population. The very low death-rates of the young states is due, in great part, to the youth of the average citizen. Another consider-

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(1) Amer. Jour. Pub. Health, April, 1917.

able factor in the states of the Pacific Slope is the low infant death-rate.

Willcox[2] disagrees with the conclusions of Tuttle relative to death-rates in young states such as Washington. His opinion is that the death-rate of the State of Washington has never been so low as 10 per 1,000 in any one year. He says that under present American conditions, and in a normally constituted but increasing population, a death-rate below 14 may be viewed with serious question. A death-rate of below 12 is presumably incorrect; that is, it shifts the burden of proof, and no states should accept or use such a rate unless the authorities responsible for its accuracy offer convincing proof that the sources of serious error have been considered and eliminated. A death-rate of less than 10 no more deserves serious statistical analysis than does the claim that vaccination does not diminish the chance of contracting smallpox.

Willcox states that a population composed largely of adolescents and young men and women with few babies and few people in middle life or older, and living where conditions were healthful, could have so low a death-rate, but an analysis of the population and life statistics of Washington does not indicate a basis for so low a death-rate.

[The first report of the United States Census Office on births and deaths in the birth registration area is a worth-while document. It gives the birth-rates, infant mortality rates and general death-rates of the sections to which it applies and, in addition, furnishes the results of many interesting comparisons and analyses.—Ed.]

Effect of Build on Longevity. Brumby[3] concludes that the mortality is high in young men who are under weight and in old men who are over weight. Conversely, it is low in fat young men and thin old ones. The principal causes of death in thin young men are tuberculosis and typhoid fever, the former being the more important of the two. The principal causes of death in obese older men are apoplexy, paralysis and heart disease. Few men from 35 to 45 per cent. over weight ever reach

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(2) Amer. Jour. Pub. Health, June, 1917.
(3) Southwest Jour. Med. and Surg., May, 1917.

65 years of age. Nearly one-half the deaths in persons 50 pounds or more over weight at ages 45 and over ever reach 65 years of age. In the following table the expected mortality of a group is 100 per cent. It will be noted, for example, that men 20 to 24 years of age who are 40 pounds under weight have a mortality rate 35 per cent. over the expected, whereas the group 45 to 49 and 40 pounds under weight have a death-rate that is 6 per cent. under the expected.

MORTALITY ACCORDING TO WEIGHT.

(Height 5 ft. 7 in. to 5 ft. 10 in.)

Graduated percentages of normal mortality. Medico-actuarial experience.

Departure from average weight stated in pounds.

Age group.	Underweight.					Average.	Overweight.					
	40 lb.	35 lb.	30 lb.	25 lb.	20 lb.	25 lb.	30 lb.	35 lb.	40 lb.	45 lb.		
Group.	pct.	pct.	pct.	pct.	pct.	pct.	pct.	pct.	pct.	pct.	pct.	pct.
20-24..........	135	131	128	124	118	104	98	100	102	103	104	106
25-29..........	122	119	117	114	110	100	98	102	105	107	108	111
30-34..........	113	111	109	106	103	97	100	106	111	115	119	123
35-39..........	105	103	101	100	98	96	104	110	117	125	133	139
40-44..........	99	97	96	95	94	94	109	114	121	130	140	147
45-49..........	94	92	91	90	94	94	112	116	122	130	139	145

Longevity. *Public Health Reports,*[4] in the diagram on page 242, arranged from the Census Office Life tables compiled by Glover, shows that females live longer than males, country people longer than city people and whites longer than blacks.

Causes of High Infant Mortality Rate. Amesse[5] gives consumption in one or both parents as one cause of the high infant mortality rate of Denver. Babies born to parents actively tuberculous, or who have recently been actively tuberculous, start with but little vitality. Among other causes of high infant mortality rates are industrialism, poor obstetric service, poor pediatric service and institutionalism. He cites Graham regarding a manufacturing establishment which started maternity insurance among its married female employees, thereby reducing the infant mortality rate 50 per cent. The women paid into the fund a small monthly sum. This provided a small sum to each prospective mother for a rest period of a month before labor and for parturient women a rest of two months after labor. In addition the

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(4) April 6, 1917.

(5) Northwest Med., March, 1917.

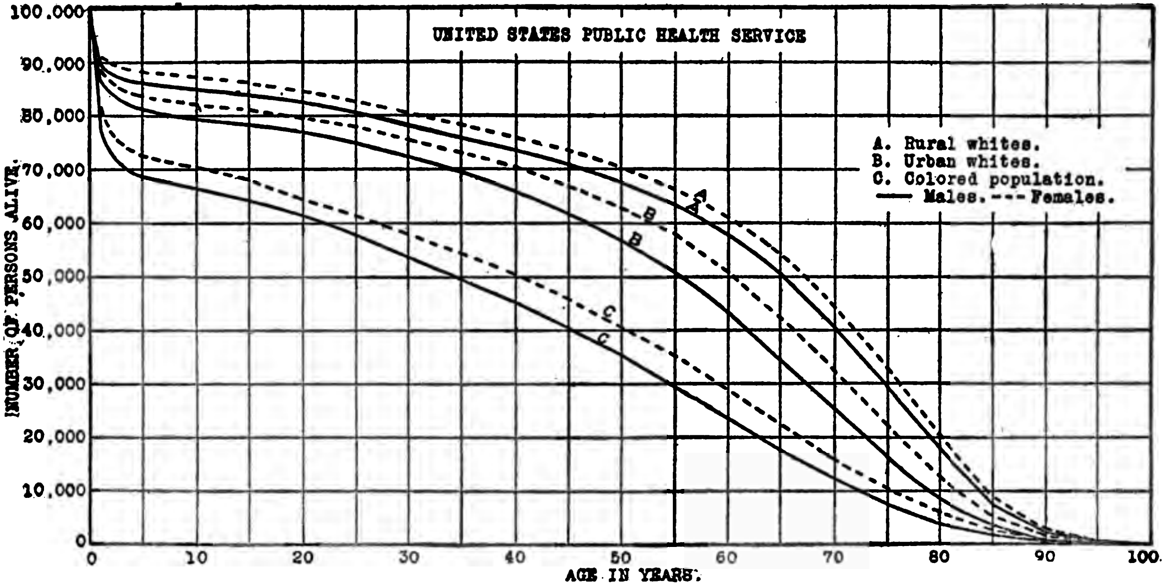

Fig. 11. Diagram showing the number of white males and white females in both the rural and urban populations, and of colored (negro) males and colored females in the total population, remaining alive at each age out of 100,000 born alive in the "original registration States."—Based upon the "United States Life Tables: 1910," prepared under the supervision of Prof. James W. Glover for the Bureau of the Census.

nursing mother was able to go home and nurse her baby several times during the day.

Negro Mortality Rates. Emerson[6] says that the negro death-rate in New York City is nearly twice that of the general population. Taking the death-rate of the general population in each instance as 1, the negro death-rates are as follows:

All diseases	1.7
Diseases of the heart	1.5
Bright's disease	1.8
Pneumonia	2.
Typhoid fever	2.2
Infant death-rate (194 negroes to 91 whites)	2.13
Tuberculosis	3.2

Birth Registration. An editorial in the American Journal of Public Health[7] pronounces the establishment of a registration area of births by the Director of the Census a big step forward. The states admitted to this registration area are those in which 90 per cent. or over of births are registered. The area in 1916 comprised Maine, New Hampshire, Massachusetts, Rhode Island, Vermont, Connecticut, New York, Pennsylvania, Michigan, Minnesota, Maryland and the District of Columbia. In these states 32.4 per cent. of the population live. It will be noted that New Jersey is omitted along with a great many states in which vital statistics are even less dependable. New Jersey's mortality statistics are of the best.

GENERAL SANITATION.

Water Supplies.

The Water Supplies of the Ohio Valley. Frost[1] says that of the 8,300,000 people who lived in the Ohio Valley 64.5 per cent. in 1915 were using water from surface sources, 9 per cent. were taking water from more or less protected watersheds, but more than half of such supplies were further protected by chlorination or filtration. Of the present population, 3,500,000 are not tak-

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(6) Weekly Bull. New York City Health Dept., April 7, 1917.
(7) February, 1917.
(1) Ohio State Med. Jour., September, 1916.

ing their water from rivers, 90 per cent. of these are taking river water that has been purified by storage filtration or chlorination. Practically all of the water purification plants have been installed within twenty-five years and the majority within ten years. Eleven cities, with a total population of 243,000, were using unpurified river water in 1914. In 1906 these cities had a typhoid rate of 76.8 and in 1914 of 74.5. Sixteen cities having a population of 1,866,000 were purifying the river water in 1914. In 1906 their typhoid rate was 90.5; in 1914 it was 15.3. The number of deaths from typhoid in these cities in 1914 was 296. Had the 1906 rate prevailed there would have been 1,688 typhoid deaths. The indicated life saving was 1,400. The saving in non-fatal cases of typhoid was 14,000 to 15,000.

Bacteriologic Examination of Water in the Field. Messerli[2] has found the use of Oldekop's agar for detecting pollution of drinking water with *B. coli* or its near relatives of great help to armies in the field. Oldekop's agar is agar mixed with neutral red. The method employed is as follows:

From 1 to 3 c.c. of water are run on the surface of the agar slants. The test-tubes are incubated either at room temperature or at 30° C. The reaction appears in two or three days.

The presence of colon group bacilli is indicated by the development of fluorescence, a canary-yellow coloration and at times the formation of gas. This reaction may be given by the ammoniacal bacteria of urine as well as those of feces. For the test, no apparatus and no special skill are required.

When troops are to move into an area an inspector equipped with tubes of culture media, pipettes and an alcohol lamp goes to the area and inoculates the tubes. Two days later the same field inspector can pass upon the waters examined. The method is especially adapted to the operations of troops in the field.

Sterilization of Water. McWalter[3] tells of a shortcoming of chlorinated water for use by armies in the field. Thirty grains of 30 per cent. chlorinated lime in

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(2) Corr.-Bl. f. Schweiz. Aerzte, Feb. 17, 1917.
(3) Jour. State Med., Feb. 19, 1917.

100 gallons of water will kill pathogenic bacteria and make a polluted water safe to drink but, unfortunately, the taste is so objectionable that soldiers in the field often refuse to drink it. In spite of the fact that lime for use by soldiers is now packed in glass-stoppered bottles, that which reaches the army in the tropics only contains from 8 to 24 per cent. chlorine. Lest they use too little of this deteriorated product the sanitarians are disposed to use too much and impart an objectionable taste. Where chlorinated water stands in a tank for two days it loses about 25 per cent. of its chlorine. As a practical measure to make the taste more palatable this (standing) is sometimes employed. If chlorinated water is boiled for two minutes it loses some of its taste. In making tea, McWalter advises that the water be cooked for two minutes before the tea is added. The writer quotes Horrocks as having devised a very delicate test for chlorine in water. When three drops of a sensitized iodine solution is added to a half pint of water containing one part in a million of chlorine a blue color is struck. This will be retained for half an hour. If 6 drops are needed to produce the blue color one part chlorine in two million of water is present.

Dakin and Dunham[4] describe a new tablet devised for the purpose of convenient, cheap and effective disinfecting of drinking water by individuals. The compound is p-sulphon-dichloramino-benzoic. The simple name given it is halozone. The tablets are made by mixing the acid (halozone), 4 per cent.; sodium carbonate, 4 per cent. (or dried borax, 8 per cent.), and pure sodium chloride, 92 per cent. Each tablet contains 4 m.g. of the disinfectant and is suitable for disinfecting one quart of drinking water. If the water is very badly polluted it is advisable to use two tablets for a quart of water. Halozone will disinfect ordinary drinking water in strengths of 1 to 300,000. The tablets are much more stable than those of calcium hypochlorite. They are more convenient. They are cheaper. "It is safe to say that the tablets could be sold at such price that 100 gallons of water could be sterilized at a

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(4) Brit. Med. Jour., May 26, 1917.

cost of one penny." Water thus sterilized is not unpalatable.

The Chicago Health Department[5] advises prospective campers to sterilize their drinking water with hypochlorite of lime tablets (furnished on application free of charge). Each tablet contains from 20 to 30 milligrams of available chlorine.

To make stock solution: Dissolve 1 tablet in a quart of water in a Mason fruit jar.

To use: Put 1 teaspoonful of the stock solution in a glass of water—8 ounces. Allow this to stand for five minutes.

Banti[6] gives a method of sterilizing water which *La Presse Médicale*[7] says was proposed first by Vergnoux, Lascard and Laroche. The method is said to satisfy all conditions very well. It is sure, simple, rapidly executed, makes use of substances easily procured and which keep well and are inexpensive.

Iodine, metallic, 5 gm.; iodide of potassium, 2 gm.; ordinary alcohol, 100 grams are mixed. To each liter of water 5 drops of the iodine mixture are added. To be well shaken.

The mixture is light yellowish and tastes of iodine. At the end of twenty minutes 5 drops of a solution of hyposulphite of soda are added (10 per cent. solution in water). The mixture is shaken well. The water loses immediately its yellowish color and iodine taste. The sterilization can not be done in wooden vessels. It can be done in glass or metal containers. Prolonged use of water thus sterilized does no harm.

Storage of Water. Houston[8] says that rivers by adequate means can be purified to any standard of safety required. Filtration of Thames River water decreases the bacterial counts 98 to 99 per cent. The reduction in ammoniacal nitrogen was 95.6 per cent.; albuminoid nitrogen, 60.6 per cent.; color, 73.2; permanganate test, 59.6.

Storage reduces the number of bacteria and of *B. coli.* It devitalizes the microbes of water-borne diseases. "An

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(5) Bull. Chicago School Sanit. Instr., June 23, 1917.
(6) Rev. Osp., April 30, 1916.
(7) Jan. 22, 1917.
(8) Lancet, Aug. 19, 1916.

adequately stored water is to be regarded as a 'safe' water."

Hard and Soft Water. Rector[9] is of the opinion that the weight of evidence is in favor of the use for drinking purposes of water containing a moderate amount of mineral matter—at least enough to avoid the flatness of taste of distilled and soft waters. He does not agree with von Wedekind[1] that the low death-rate from apoplexy among sailors in the United States Navy is due to the habitual use of distilled water. He does not express an opinion as to the harmfulness of the habitual use of very hard waters, though he does at least inferentially claim that they are harmless through his statements that the habitual use of milk many times harder than water does not do harm; that the use of certain mineral waters is a curative procedure and that certain districts in which the water is hard do not have higher death-rates than the average. The following comparative analysis of mineral waters will prove of service to physicians:

TABLE I, SHOWING COMPOSITION OF FOREIGN WATERS.[8]

Name and Location.	Chlorides P. P. M.	Bicarbonates P. P. M.	Sulphates P. P. M.	Total Solids P. P. M.
Kranchen 1, Ems	1026.03	2409.93	71.21	3556.33
Kranchen 2, Ems	1085.70	2318.05	65.08	3518.88
Kesselbrunnen, Ems	1068.83	1354.52	56.47	3524.18
Kaiserbrunnen, Ems	974.78	2360.79	57.73	3440.41
Victoriaquelle, Ems	1016.61	2447.94	62.62	3576.79
Konig Wilhelms Felsenquelle, Ems	996.89	2388.02	61.94	3482.61
Neuquelle, Ems	889.71	2066.04	81.82	3303.44
Stahlbrunnen, Langenschalbach	6.72	556.35	11.66	606.81
Weinbrunnen, Langenschalbach	8.63	1489.48	13.66	1558.27
Paulinebrunnen, Langenschalbach	6.60	481.65	10.48	524.64
Neubrunnen, Langenschalbach	6.22	587.51	15.67	638.58
Ehebrunnen, Langenschalbach	5.95	904.44	12.43	969.84
Adelheidbrunnen, Langenschalbach	6.55	675.31	21.80	740.03
Schactiquelle, Schlangenbad	270.48	75.44	13.86	402.40
Sulphur Spring, Weilbach	271.31	794.82	38.82	1511.75
Sodio Lithia, Weilbach	1258.82	1640.00	55.12	3190.56
Koniglich Selters, Niederselters	2352.24	2008.30	46.30	4437.36
Fachingen, Fachingen	671.73	4808.46	47.85	5555.14
Geilnau, Geilnau	36.10	1958.10	26.10	2045.40
Trinkquelle, Nenndorf	227.49	516.05	1868.75	2684.63
Brine Spring, Nenndorf	56521.11	128.40	....	61632.20
Rehburg, Rehburg	50.44	385.41	491.27	938.28

[8] Album of the Spas and Mineral Springs owned by the Royal Prussian Board of Domains.

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(9) New York Med. Jour., Dec. 6, 1916.
(1) Med. Record, Jan. 9, 1915.

TABLE II, SHOWING COMPOSITION OF AMERICAN WATERS, SARATOGA SPRINGS.[1]

Name.	Chlorides P. P. M.	Sulphates P. P. M.	Bicarbonates P. P. M.	Total Solids P. P. M.
Old Red	382.27	7.91	1495.55	1968.16
New Red	903.27	9.46	1909.67	2928.22
Magnetic	1112.52	14.95	1942.25	3129.17
Emperor	2664.44	4.88	3140.05	5851.73
Peerless	2718.58	31.67	3753.43	6541.21
Hathorn 1	3338.57	15.56	4146.28	7542.21
Hathorn 2	11887.36	5.33	7336.74	19348.72
Hathorn 3	10000.51	10.04	6511.84	16608.42
Coesa	5728.18	8.37	5179.35	10956.62
Geyser	2254.07	19.36	4710.24	7023.92
Adams	6406.90	3.40	5163.81	1???.??
Pump Well No. 4	1504.13	11.13	2352.51	389?.?7
Flat Well No. 2	7067.41	4.26	5941.27	13242.48
Ditch Well No. 2	2083.57	7.91	2571.93	4766.08
Island	4446.51	12.17	4203.06	8704.73
Other Waters:				
Veronica Water,[2] Santa Barbara, Cal.	3339.74	15698.30	1397.80	22842.64
Mt. Clemens Water,[2] Mt. Clemens, Mich.	26910.50	777.60	217.50	12864.80
Manitou Water,[2] Manitou, Colo.	440.80	324.20	3530.20	4344.88

[1] Report of the Commissioners of the State Reservation at Saratoga Springs, 1913.

[2] Bulletin 98, Bureau of Chemistry, Mineral Waters of the United States.

Bubble Fountains. Pettibone, Bogart and Clar[2] found streptococci in bubble fountains as a possible source of streptococcus tonsillitis in the University of Wisconsin. The cocci remain dancing in the water of a fountain with a perpendicular column of water. The authors recommend fountains with a discharge of water at an angle to the perpendicular.

Whittaker,[3] finding the drinking fountains at the University of Minnesota capable of transmitting infection, investigated the shape and projection angle of the nozzle as a source of trouble. Figure 12 (page 249) shows orifices found in drinking fountains examined; number 3 shows a nozzle suggested by Whittaker.

Disinfection of Swimming Pools. Manheimer[4] summarizes the advantages of different methods of disinfecting swimming pools as follows:

(*a*) Calcium hypochlorite. High efficiency, cost very low, easily handled.

(*b*) Chlorine gas. Efficiency high, cost very low, easily handled.

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(2) Jour. Bacter., 1916, Vol. I, No. 5.
(3) Pub. Health Reports, May 11, 1917.
(4) Jour. Infect. Dis., January, 1917.

(*c*) Lectrocide. Cost ten times as much as for hypochlorite, high efficiency, very easily handled.

(*d*) Copper sulphate. Cost high, efficiency low, stains tiles, causes reduction in transparency of water, easily handled.

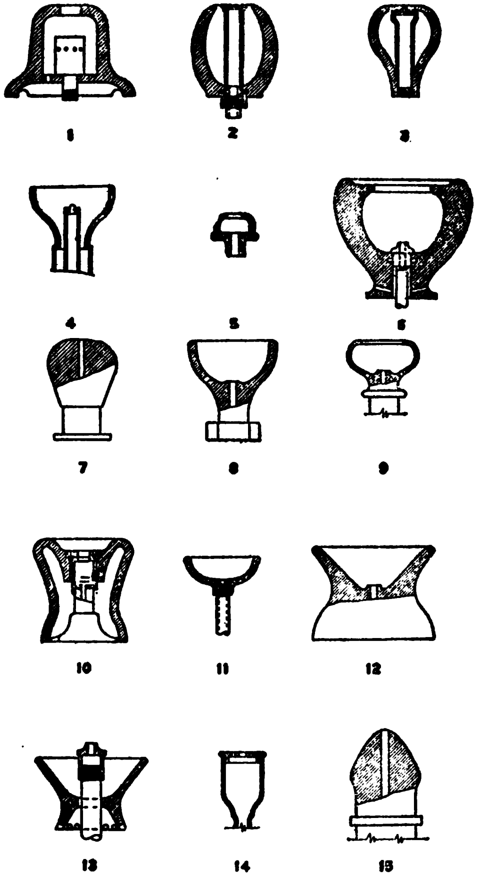

Fig. 12. Nozzles of drinking fountains examined.

Calcium hypochlorite was most efficient when it was used as a single daily treatment. Copper sulphate gave better results when gradually and continually applied. He was not able to form an opinion as to the efficacy of ultra-violet light disinfection, though he noted lower counts when the method was used than with untreated water and a longer treatment with the rays he thought held promise. Lectrocide is a chlorine compound made by treating salt brine electrically.

Acting upon the report of Dr. Biggs a commission on tuberculosis with Doctors Farrand and Miller and Professor Gunn and Mr. Folkes as members was sent to France in July, 1917.

FOOD.

Warranty in the Sale of Meat. C. W. Stiles[1] contends that the legal use of the words "diseased meats" should be such as to indicate such meats as are likely to produce disease when eaten by human beings and that the implied warranty in the sale of foods is predicated upon the assumption that the food shall be properly prepared before it is eaten. Acting upon these opinions, Stiles testified in a given suit where it was proven that a case of human trichinosis resulted from the eating raw of a certain lot of trichinous pork that the vendor should not be held responsible.

No possible method of inspection or examination can guarantee that pork does not contain trichina. Therefore, the only safe method of preparing pork for human consumption is to cook it. That being the case when the complainant ate raw pork he brought about his own injury by his own neglect.

In a case where some butterfish had been condemned because their organs were infested with a mematode worm, Stiles held that there should have been no condemnation. There is no evidence that this variety of worm can infect, infest or otherwise harm human beings. Stiles' contention is that the meat from these butterfish was not diseased in a proper sense in that it was not likely to produce disease when eaten by human beings.

[The fallacies in Stiles' reasoning in the first case lie

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(1) Jour. Amer. Med. Ass'n., March 3, 1917.

in the following points: The custom of eating raw pork is well established among certain peoples. The vendor had or should have had common knowledge of this fact. In selling to people among whom this custom prevails he is required by law to take reasonable precautions to protect the purchaser. A certain type of examination, while it may not furnish certain absolute or always perfect protection against the presence of large numbers of trichina in meat, is reasonably effective in that direction. The vendor is required to take such reasonable precautions. Methods in use by the producers of meat supervised by the Federal government, approved by the Bureau of Animal Industry, destroy the trichina in meat. The vendor can be legally required to show that he took advantage of this precaution to protect his trade in view of the custom of that trade, or a part thereof, in eating raw pork.—Ed.]

Milk Standards. The Milk Standards Commission of the New York Milk Committee[2] devotes its third report to a re-affirmation of the previously recommended standards for milk and add thereto some standards for ice-cream, butter, buttermilk, condensed milk and skim milk.

The standard of 8.5 per cent. solids, not fat, as a requirement for whole milk has been criticised as too high. The Commission affirms its previous position that this requirement should be insisted upon. It can be met without difficulty. The criticism that the bacterial standards are too low for small cities with a very well-regulated milk supply the Commission thinks is well taken. It is stated in this report that the standards given are proper for places where the milk supply comes from a considerable distance. Places which draw their milk from nearby farms should have much lower bacterial counts as standard.

The most important recommendation of the commission is that milk shall be graded and classified and that all milk except that of the highest grade shall be pasteurized.

The Commission reaffirms its advocacy of the adoption by municipalities of pasteurization as a public health

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(2) Pub. Health Rep., Feb. 16, 1917.

measure, but in view of the recent reports made by Dr. Hess of New York City recommends that orange juice be added to the diet of babies fed on pasteurized milk. Dr. Hess came to the conclusion that babies fed on pasteurized milk exclusively developed a subacute form of scurvy, but that a small ration of orange juice served to prevent this or to cure it after it had already developed.

The chemical standard for straight milk is 8.5 per cent. solids and no fat and 3.25 per cent. milk fat. For skim milk, 8.75 per cent. milk solids. For cream, not less than 18 per cent. milk fat. The report states that bacterial examinations of the same specimen of milk by different examiners, or even of two samples by the same examiner, may vary as much as 28 per cent., though it should not exceed 10 per cent. For this variation the standards provide by allowing ample leeway in a class. Nevertheless, prosecutions should never be made nor publicity given on the basis of a single sample.

The Commission calls attention to the fact that the standards set are those which should be insisted upon for large cities with a long milk haul and when the milk is more than 24 hours old when it is consumed. Smaller cities with a shorter haul and with less than 12 hours elapsing between production and distribution to the consumer can maintain and should have far lower standards.

The report restates the standards for grades A, B and C milk.

An important part of the third report relates to standards for ice-cream. Among these are:

"Ice-cream is a frozen product made from pasteurized cream and sugar or pasteurized milk and sugar and shall not contain less than 8 per cent. milk fat. It shall not contain any preservatives, neuralizing agent, saccharin, renovated or process butter fats or oils foreign to milk or to other ingredients allowed. It may contain wholesome eggs, harmless coloring matter, flavoring, sound, clean, mature fruits and nuts, pastries and approved thickening not to exceed 0.5 per cent."

It is recommended that two gades of ice-cream be allowed—grades A and B. Grade A is to be made from grade A milk or cream and other allowed ingredients and is not to contain over 100,000 bacteria per cubic centimeter. Grade B ice-cream is to be made from grade B milk and cream and other allowed ingredients and is not to contain over 1,000,000 bacteria per cubic centimeter. Ice-cream is not to be refrozen.

The Commission recommends that ice-cream factories be scored on the following score card:

SCORE CARD FOR ICE CREAM MANUFACTURING PLANTS.

		Perfect.	Allow.
Location		15	
Above ground	5		
Free from contaminating surroundings (no score if bad)	3		
Protected from street dust	3		
Not connected with any other room	2		
No other business in same establishment	2		
Construction		15	
Well lighted (natural)	2		
Well ventilated	1		
Thoroughly screened	2		
Water-closet does not open directly into establishment	2		
Separate room for washing utensils	2		
Floor: Smooth, water-tight, well drained	4		
Walls and ceiling: Smooth and tight	2		
Equipment		30	
Steam at all times	5		
Hot water at all times (no credit unless running hot water)	3		
Sterilizer for utensils	3		
Connections for sterilizing apparatus	2		
Pasteurizer:			
Holding machine	4		
Automatic recording device	1		
Refrigeration: Mechanical (proper ice box, 1)	2		
Freezer: Type, connections, etc	2		
Sanitary piping	2		
Wash basins and towels ample	1		
Utensils:			
Condition	1		
Ample for the service	1		
Racks for	1		
Employees:			
Health certificates for	1		
Clean suits provided	1		

Methods		40
Freedom from flies	2	
Protection of material:		
Before manufacture	3	
During manufacture	3	
After manufacture	3	
Utensils and apparatus sterilized (washed in hot water, 1)	3	
Cleanliness:		
Floors	3	
Windows	1	
Apparatus	3	
Walls and ceiling	1	
Utensils	3	
Employees	3	
Character of materials used:		
Milk and cream, grade A (grade B, 4; grade C, 1)	6	
Condensed milk, eggs, etc	2	
Thickeners, none used	1	
Artificial coloring, none	1	
Degree of refrigeration of final product	2	
Total		100

As to buttermilk, the Commission recommends that buttermilk be made from pasteurized milk and cream, and that buttermilk be sold under grades and that the package show the name of the dealer and the date of manufacture.

As to skim milk, the Commission says: "The use of skim milk as a food is approved and the repeal of laws that prohibit the sale of skim milk as a food is urged. Skim milk should not contain less than 8.5 solids not fat."

As to condensed milk, the Commission recommends that it be sold according to grade and that grade A condensed milk be made from grade A milk and that the label so state.

Butter should contain not less than 82 per cent. milk fat. It is recommended that butter be divided into grade A, made in proper manner from grade A milk and grade B, made in a proper manner from grade B milk. All milk and cream to go into butter should be pasteurized.

Milk Analysis. While it is impossible to abstract

Standard Methods of Milk Analysis,[3] a few extracts should prove of service as well as of interest.

Freshly drawn milk should not contain more than 10,000 bacteria and can easily be brought down below that. If the bacterial count is higher than that it means that the cows have diseased udders or the vessels are filthy or the milking methods are uncleanly. Since the number of bacteria does not increase materially under five to seven hours, a community in which the milk is delivered within six hours after being milked is justified in demanding that a bacterial count of 10,000 shall be maintained. Night's milk, if quickly and properly cooled, should not have more than 10,000 bacteria when delivered. A count of 50,000 in such a community means that the cows have diseased udders or that the milking methods are very dirty or that the milk has been kept warm. This holds true even of milk in summer. Where the milk is marketed not more than 24 hours after being produced it should not have over 100,000 bacteria in winter and 200,000 in summer. Numbers in excess of these mean dirty methods or diseased udders. Where milk is not over 48 hours old when it reaches the market a count of one million should be the top limit. Counts of 200,000 should be attainable. Counts of more than a million mean dirty methods, dirty cans or diseased udders.

In spite of the fact that Breed is a member of the Commission they do not recommend the general adoption of the method of direct bacterial examination of milk. They think it has the advantage for the producer and the milk merchant, but that for health departments it is not equal to the culture method.

[This report on standard methods for milk analysis and others on standard methods for water and air analysis are issued by the American Public Health Association.—ED.]

Grading of Milk. Bateson[4] contends that it is impossible to make any considerable part of the milk supply comply with the requirements of grade A pasteurized.

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(3) Ravenel and Others: Amer. Jour. Pub. Health, December, 1916.

(4) Buffalo Med. Jour., December, 1916.

So far as grade A raw and certified milk are concerned, those are quite impossible.

The requirements for grade A are as follows: The farms must score 25 out of a possible 40 on equipment and 43 out of a possible 60 on methods. The cows shall be healthy, as disclosed by an annual physical examination made by an approved veterinarian. The milk shall not have more than 200,000 bacteria prior to pasteurization nor more than 30,000 at any time after pasteurization and before delivery.

A fair percentage of milk conforms to these requirements in the winter, but in summer conditions are different. In summer dairy work is neglected, barns, cows and pails are dirty. The farm hand comes in from his work tired and dirty. He milks with dirty hands in dirty pails. He puts the milk into dirty cans. The next morning he gets up and hurriedly milks into dirty pails, gets the milk off to the train and gets to the field.

The only remedy that Bateson can see is to allow 500,000 bacteria before pasteurization and 100,000 after and to demand so-called perfect pasteurization and a temperature of 50 or less. He says that even where pasteurization is not required by law 90 per cent. of the milk is pasteurized.

Nothing but almost universal pasteurization has saved us, and the milk industry as well, from disaster.

This article appears just at a time when the Commission on Milk of the American Public Health Association[5] is reacting to the criticism that its standards for grade A raw and grade A pasteurized are low by suggesting that lower counts be demanded in smaller cities and towns.

[As a member of this Commission I was, and am, satisfied that smaller cities can maintain lower standards than those set by the Commission. Dr. Bateson's contention that better pasteurization and stricter conformance with icing requirements are essential in the large cities is correct.—ED.]

Milking Machines and Bacterial Counts. G. L. A. Ruehle, R. S. Breed and J. A. Smith[6] find that a milking

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(5) Pub. Health Rep., Feb. 16, 1917, pages 251-254, this volume.
(6) Amer. Jour. Pub. Health, October, 1917.

machine can produce a milk with high bacterial count or one with low count dependent upon the method of use. In one series of tests in which the parts of the machine were carefully sterilized before the test and supposedly sterile water was put through the machine there were two bacteria in the water before it was put through, four after the first milking, four after the second, five and one-half after the third and nine after the fourth—an average of six tests.

This experiment demonstrated that milking can be done with practically a sterile product. The metal parts were sterilized with steam under 15 pounds pressure and the rubber parts with hot water and chloride of lime solution. In practical work on the New York Experiment Farm the bacteria content of milking-machine-produced milk ranged from 141 per c.c. to 25,000 per c.c.

A series of tests made on milk milked by machines on farms near the station showed bacteria counts ranging from 5,800 to 1,095,000. Of the five farms tested one ran under 10,000, one between 30,000 and 100,000, two between 100,000 and 1,000,000 and two were over a million. The two high counts were on farms where the parts of the machines were not properly sterilized. The rubber parts were being washed in a chloride of lime solution which contained no free chlorine.

The conclusion of the writers is that the purity of the product depends upon the care used in cleaning and in handling the machine. The results can be made better than with the best hand milking. They quote Harding as being of the opinion that the average bacteria content of milk as drawn from the udder is 500.

[The constantly increasing difficulty of getting labor on dairy farms makes the milker question one of great importance. If milk of standard quality can be produced with machine milking, machines are liable to come into general use.—Ed.]

Milk Control. North[7] presents the purposes and methods employed in modern milk control as follows:

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(7) Med. Record, Aug. 26, 1916.

Purposes: To insure food value of the milk.
To insure safety from pathogenic organisms.
To promote cleanliness and decency in handling the milk by producers.

Methods:
1. Gradation and standardization of milk. The unlimited number of degrees of excellence are arbitrarily divided into three grades:
    - A. Milk clean and safe, price moderate but above other grades, suitable for feeding infants.
    - B. Milk moderately clean, sufficiently safe for drinking purposes for adults, and
    - C. Milk unfit for drinking purposes but suitable for some sorts of manufacturing purposes.
2. Pasteurization: Furnishes a guarantee of safety, is easily controlled by health officers, changes in food value slight if any, and far offset by insurance of safety added. Babies may be fed orange juice to prevent rickets and scurvy.
3. Tuberculin testing of dairy herds: Has been unduly emphasized. Protects only against bovine type and even with it some tuberculous cattle remain in the herds. Pasteurization has made it unnecessary.
4. Veterinary inspection of cattle: Insures cattle free from obvious disease.
5. Medical inspection of dairy employees: Only safeguard is the reporting of infectious diseases by dairymen, as examination of employees is difficult to obtain, expensive and unnecessary if milk is to be pasteurized.
6. Bacterial and chemical testing: Chemical tests give information as to adulterations of the milk and the maintenance of its food value. Bacterial count has proven to be a most potent factor, as the count parallels the purity and freshness of the milk. By running counts on the supplies of various producers information is obtained which aids the central office in directing its inspection where it is most needed.

Culture Medium for Testing Milk. Clark and Lubs[8] advocate the substitution of bromcresol purple or dibromo-orthocresolsulfonphthalein for litmus in litmus milk cultures. In their experience it is a reliable indicator for those organisms usually grown in litmus milk. It is not unduly expensive. The color changes in litmus milk may be due to reduction or even destruction of the dye.

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(8) Jour. Agri. Research, July 16, 1917.

It is a true and dependable indicator of hydrogen-ion concentration.

Dairy Score Card. North[9] advises a modification of the accepted dairy score card. In his score card primary equipment is given a value of 30; primary methods, 60; secondary equipment, 3.3, and secondary methods, 6.7. Such items as location and construction of stables and of milk houses under equipment and cleanliness of the barn and barnyard and milk houses; under methods, items of prime importance on present score cards are relegated to secondary equipment and secondary methods respectively. Incidentally, the items transferred are those which call for the greatest expenditure of money. In laying the foundation for the recommendations of changes North tells of one farmer who kept his bacterial counts between 1,000 and 9,000 in spite of a meager equipment by the following simple procedures:

1. Milking pails and cans scrubbed with brush and alkaline powder.
2. Milking cans and pails scalded with an abundance of boiling water provided twice daily.
3. Strainer cloths boiled twice daily more than two hours.
4. Hands of milkers washed and dried before milking.
5. Cows' udders washed and dried before milking.

In a series of observations the average bacterial count was reduced from 430,000 to 139,000 by the substitution of small-mouth pails for large-mouth pails. In the same series the addition of extra care in boiling and sterilizing utensils reduced the average count of 139,000 to 37,000.

As the result of a series of observations of conditions in actual practice checked by bacterial counts North established the values for his score card.

Pasteurization of Milk. Williams[10] says: The relation of communicable diseases to the consumption of raw milk was surmised as early as 1854. Since that time many epidemics have been traced to diseased persons associated with the care of milk. The use of raw milk

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(9) Amer. Jour. Pub. Health, January, 1917.
(10) Med. Record, Oct. 28, 1916.

as a source of infection has been more keenly recognized in Europe than in America and the use of boiled milk has been earnestly advocated there. With the increasing difficulty of supplying fresh milk to our great cities milk dealers began to heat the milk in order that it might be kept longer. At first the "flash system," consisting of passing the milk rapidly over heated coils raised to the temperature of 187° F. was used. Health boards soon raised the following objections to pasteurization:

1. Sterilization of filthy milk was practiced by unscrupulous dealers.
2. The milk would spoil before souring physicians maintained.
3. It would result in scurvy.

Six years ago various typhoid epidemics in New York City, traced to the milk, convinced the authorities of the necessity of pasteurizing the entire milk supply. The holding method was chosen.

The following objections are still made against pasteurized milk:

1. It produces scurvy in infants.
2. It has a stale, flat taste.
3. It increases the cost of milk.
4. It diminishes the amount of cream in a bottle of milk.
5. It devitalizes and reduces the food value of the milk.

These objections may be readily met as follows:

1. Infant mortality rates in New York City show no increase in deaths from scurvy.
2. Milk-borne contagion is more dangerous than scurvy.
3. Correct pasteurization does not alter the taste.
4. The amount of butter-fat in the milk is not reduced.
5. The increased cost is not over 1 cent per quart, which is greatly offset by the added insurance to health.

Furthermore, in cities having the larger part of their milking pasteurized for the last three to five years there has been a great decrease in infant mortality and in deaths from diarrheal diseases.

[The cost of pasteurization is much less than a cent a quart.—Ed.]

Milk-Borne Diseases. E. R. Kelley,[1] as a result of a study of epidemics in Massachusetts between 1910 and 1914, came to the conclusion that the prevention of milk-borne tuberculosis was the principal justification for the expenditure of money for milk control. He sent out a questionnaire to all local health departments. The information from 136 local departments, representing 80 per cent. of the population of the state, is tabulated as follows:

NUMBER OF CASES AND DEATHS DUE TO MILK AND OTHER CAUSES.

Diseases.	Number Cases, 1900-1913.	Number Deaths, 1909-1913.	Number Cases Due to Milk.	Number Deaths Due to Milk.	Number Cases Milk Suspected.	Deaths Milk Suspected.
Typhoid fever.	11,282	1,425	553	37	135	8
Diphtheria ...	31,866	2,580	11	1	49	1
Scarlet fever..	31,012	991	495	8	57	0
Septic sore throat	2,436	49	1,914	48	0	0
Totals ...	76,596	5,045	2,973	94	241	9

He concludes that, as compared with other sources of infection for diphtheria, milk is negligible. Milk as against the field is more important as a source of scarlet fever. His figures prove that at least 5 per cent. of the typhoid is milk borne. Septic sore throat is the milk-borne disease *par excellence,* but then there is not much septic sore throat. He accepts the figures of Park and Krumweide as to proportion of tuberculosis in children which is due to bovine tubercle bacilli, and from this he concludes that tuberculosis is the principal justification for milk and dairy-farm inspection.

Bondrean[2] asks that physicians inform themselves better about the general milk question and, particularly, as to the milk supplies in the communities in which

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(1) Jour. Amer. Med. Ass'n., Dec. 30, 1916.
(2) Ohio State Med. Jour., March, 1917.

they live. He recently found three farms where milk was being marketed although members of the family had typhoid fever. These facts were known to the attending physicians but they had done nothing about it.

He has recently investigated two epidemics of milk-borne diphtheria. Septic sore throat is often milk-borne. He has not seen any epidemic of milk-borne scarlet fever recently. He accepts the opinion that tuberculous milk is responsible for much of the tuberculosis.

The greatest harm done by bad milk is due directly to diarrheas in infants. In the five years between 1906 and 1910, 1,965 babies died from diarrhea in Cincinnati. In 1911 to 1915, in spite of the increase in size of the city, the number fell to 1,196. This was due in great part to improvement of the milk. Bondrean thinks that all milk except the certified should be pasteurized. In addition there should be statewide dairy inspection.

Court Decisions Relative to Milk Ordinances. Public Health Reports[3] contain a decision in a case arising in Rochester to the effect that milk and cream dealers can be compelled to submit to a Widal test as a requisite for receiving a license.

The same publication in a later issue[4] contains a decision in a case arising in Chicago to the effect that an ordinance requiring the pasteurization of milk is valid. The same court decided that an ordinance requiring transportation companies to hold milk at a temperature lower than 55° F. is invalid unless it can be shown that the transportation agent can ascertain the temperature without having access to the interior of the can.

Clarification of Milk. E. G. Hastings[6] does not approve of clarification of milk. He quotes McClintock (*Milk Trade Jour.*, August, 1916) and Hinkelman (*Ill. Med. Jour.*, 1916) as favoring it, and Bahlman (*Amer. Jour. Pub. Health,* 1916) and Hammer (Bulletin 28, Iowa State Coll. Agric.) as opposing it. He thinks the work of Hammer and Bahlman is more conclusive than that of Hinkelman and McClintock. He thinks

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(3) Jan. 12, 1917.
(4) Jan. 19, 1917.
(6) Jour. Amer. Med. Ass'n., March 24, 1917.

that no city should pass an ordinance requiring clarification.

ALCOHOL.

Health Department Opposes Use of Alcohol. Emerson[7] holds the use of alcoholic beverages to be a public health problem. He says that health departments must teach consumers not to use alcoholic beverages. He bases his conclusion upon the physiologic effects of the drug. In accident work Brickley found that alcohol causes accidents, obscures diagnoses, increases the danger of infection and intercurrent complications and increases mortality.

The use of alcohol increases the danger of metallic poisonings. It reduces the resistance to disease. It delays the perception of signs and thus increases the possibility of accident.[8] The same issue of the same journal contains the following report on the foodstuffs used in liquor manufacture:

According to the report of the Commissioner of Internal Revenue for the year ended June 30, 1916 (page 138), there were used during that year for the production of distilled spirits in the United States the following materials:

Corn	32,069,542	bushels
Rye	3,116,612	"
Malt	4,480,588	"
Wheat	3,373	"
Barley	148	"
Oats	9,807	"
Other materials	68,822	"
Molasses	152,142,232	gallons

Omitting wheat, oats, barley, and "other materials," and reducing corn, rye, malt and molasses to pounds, we get a total of 3,603,911,916 pounds of grain and molasses.

The census for 1900, Vol. 9, page 602, gives the following figures as to materials used in the manufacture of fermented liquors:

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(7) Amer. Jour. Pub. Health, June, 1917.

(8) Some of these conclusions are quoted from Benedict and Dodge, Jour. Amer. Med. Ass'n., March 25, 1916; Brickley, Boston Med. and Surg., May 20, 1917.

great to render unjustifiable the substitution of the former for the latter in many instances, even in emergencies. Where more prolonged action is desired, sodium nitrite, which, dose for dose, is even slightly less expensive than nitroglycerin, deserves to be preferred. Erythrol tetranitrate is at present seventy-five times more expensive than sodium nitrite; and though more prolonged in its action than the latter, it is liable to produce prolonged headache, and besides it is dangerously explosive, while sodium nitrite is nonexplosive. The erythrol preparation might, however, be unequaled by any other body of this group for those patients with angina pectoris who are awakened at night by the pain. Spirit of nitrous ether is about five times as expensive, dose for dose, as nitroglycerin. The substitution of a simple mixture of alcohol containing 0.25 minim of the spirit of nitroglycerin to every thirty minims of undiluted alcohol, would probably be justifiable.

NON-PHARMACAL THERAPEUTICS.

The Value of Physical Methods of Treatment. Of methods of treatment such as electricity, *x*-ray, vibration, light, heat, massage, and water, O. B. Beer[2] has this to say: "These things are not held up as cure-alls, but surely do constitute a very important branch of medicine. They have long passed the experimental stage and are being recognized and used more and more by the up-to-date physician. The author is not a drug nihilist but a strong believer in their use and has seen many lives saved by medicines. But the use of drugs has been and is greatly abused. Why do so many of our patients drift to the drugless healer? Simply because we can not give them what they want, cure them without making a drug shop of their stomachs. What do we have to offer when medicines fail? The majority of us have nothing. We have become so set in our ways that the advance in therapeutics has long since passed us. We still stick to the prescription pad and the nauseous con-

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(2) West Virg. Med. Jour., February, 1917.

The embryonic period—the first two months of pregnancy.

The germinal period—stretching back into the lives of the parents prior to the time of conception.

The influence of the alcohol habits of mothers during the fetal period are less than those in any other period. He accepts the view of Nicloux that alcohol can pass from the blood of the mother through the placenta into the body of the child but the tissues of the child are nearly as resistant to poison as are those of the adult. The child may be intoxicated without being permanently harmed. Women who drink very heavily during the fetal period bear healthy children. This is especially the case if the mother refrains from drink during the last three months of pregnancy. The harm done by the drinking habits of mothers is much greater when the drinking is done during the embryonic period—the first two months of pregnancy. Ballantyne accepts the opinion of Fere that alcoholism of the mother during this period causes retarded growth and arrested or misdirected development. He thinks that the most serious effects of alcoholism on childlife is that which results from alcoholism of prospective parents during the germinal epoch. He accepts the demonstrations of Stockard that animals kept intoxicated for long periods prior to mating suffer such changes in their reproductive glands as result in stunted, retarded or otherwise harmed offspring.

DISINFECTION OF SHIPS.

Fumigation of Ships. Corlette[2] does not advocate pyretheum powder, culicide, formalin or sulphur as an agent for destroying mosquitoes in ships. The first three are inefficient and sulphur is destructive and harmful to fabrics and metals. Hot-air fumigation is often effective. Bugs, mosquitoes and fleas die at 113° F.; cockroaches at 120°; lice and their eggs are destroyed at 131°; ordinary weevils at 122° F.

Carbon sulphide, 10 pounds to the 1,000 feet of air and 1,000 bushels of grain, used at temperatures over

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(2) Med. Jour. Austral., Nov. 4, 1916.

70° F., is very effective in killing weevils in wheat and other grain. There are marked disadvantages, however. It is explosive, it is offensive and it destroys the baking qualities of flour.

Hydrocyanic acid gas is very much the most effective fumigant in killing insects. The amount of cyanid of potassium to be used varies from 6 ounces per 1,000 cubic feet of air to 1 pound, dependent upon the tightness of the walls of the enclosure. The exposure should be for about 5 hours. Even better than German cyanide (cyanide potassium) is American cyanide (cyanide of sodium). The grade to use is known as "130 per cent. cyanide" in commerce. McDonnell's formula for the use of this salt is: cyanide, 3 ounces; commercial sulphuric acid, 4 fluid ounces, water 6 fluid ounces, for 1,000 cubic feet of air. Woglum modifies this to 1-1½-2. He refers to a method devised by Harker.

Harker passes pre-heated air under pressure through burning coal. The "smoke" contains less than 10 per cent. oxygen. The gas is rich in CO. The soot and dirt are washed from this gas and it is used to put out fires and to kill rats especially on ships. The Melbourne Habor Trust has a ship equipped to make the Harker gas for the purpose of extinguishing fires and killing rats. The writer suggests that this gas heated to 122° F. be used to kill insects.

Wilson[3] gives the following methods of fumigating ships. The compartments are to be sealed tightly. The cubic feet of air space must be estimated carefully.

Sulphur dioxide: To kill mosquitoes burn 2 pounds to 1,000 cubic feet. Expose for 24 hours. For rats use 2 to 4 pounds. Expose 6 to 12 hours. Use a Dutch oven. Break up the sulphur in small bits. Place in the oven and pour alcohol over it. Have a pocket in the sulphur for the alcohol, or saturate a small bit of cotton waste with it. To avoid fire place the ovens in pans containing a little water.

Funnel gas rich in CO is made from coke by the Harker process. Several Harker outfits are used by the Public Health Service.

Hydrocyanic acid gas is very effective with exposures

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(3) Texas State Jour. Med., January, 1917.

of one hour. If the rooms are well blown out after this gas is used one can enter in a few minutes with safety.

1. Of the three, sulphur is the best. Funnel gas is the most expensive.
2. All three kill rats efficiently. Funnel gas can not be depended on for fleas, mosquitoes or flies. Hydrocyanic gas is most diffusible and therefore best for ships with cargoes.
3. Hydrocyanic gas and funnel gas are the quicker methods.
4. Sulphur does most damage. There is danger of fire with sulphur. At present HCN is the best all round fumigant for rats and insects.

Fumigation with Hydrocyanic Gas. Grubbs[4] says that where a person fumigating with HCN gas must climb out of a cellar or hold a limit of 0.024 per cent. gas in the air is about the maximum (1/2 ounce sodium cyanide to 1,000 cu. ft. of air). The best test animals for the gas are mice and tame rats. Cats are satisfactory. Guinea-pigs are quite resistant and should not be used. In a later report (May 11) Grubbs advocates the use of electric fans where available as a means of diffusing HCN gas.

SANITATION OF LAUNDRIES.

Laundries and Spread of Contagion. Schroeder and Southerland[5] in investigating laundries in the city of New York did not find much that led them to think contagion was spread by laundries, although there was much to criticize adversely. The best conditions were maintained in the large steam laundries where all the work was done on the premises. The Chinese laundries were better than the hand laundries. The use of the "blow can" for dampening clothes is universal in Chinese laundries and may lead to infection. Very little washing is done in hand laundries. Clothes from many sources are packed together in large net bags and sent to steam laundries where they are washed by dipping the bags in hot water and soap. The washing is not

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(4) Pub. Health Rep., April 20, 1917.
(5) Pub. Health Rep., Feb. 9, 1917.

thorough enough for either safety or cleaning. They are returned to the hand laundry wet and are there dried in primitive dryers, and ironed. In most steam laundries the drying rooms are hot enough to kill all pathogenic bacteria. Schroeder and Southerland find that most laundries are very unhygienic places from the standpoint of those who work in them.

DISPOSAL OF SEWAGE AND OTHER WASTES.

Rural Privies. Nesbitt[6] writes that in Wilmington and New Hanover County, North Carolina, pit privies have been entirely abolished. He advocates a modified L. R. S. privy. This works satisfactorily provided kitchen sink water is not run into it, or where bath-water has been run in, or where the privy has been overloaded or stopped up. Kitchen water stops septicization. Bath-water dilutes too much. Nesbitt has devoted considerable attention to the details of the L. R. S. privy and has modified it in several particulars. He builds them of cement. The capacity of the sludge tank is calculated on a basis of 3 cubic feet for each user under privy conditions and 5 cubic feet if the tank communicates with a plumbing installation. The tanks must be thoroughly waterproof inside and out. He gives exact details as to points of entrance and exit of pipes. He concludes that the effluent from the Nesbitt modification of the L. R. S. method does not cause soil pollution in a soil such as that of his section. He has examined the water from 700 shallow driven wells located in his section. The only ones that he has found free from pollution are those which are located from two to five hundred yards from any source of pollution —stables, privies, pig-styes, etc.

Garbage Disposal. The *Lancet*[7] endorses, but with some reservation, the action of the English Local Government Board and Board of Agriculture in advising that most of the waste now going into garbage incinerators be consumed by pigs. To this end they advise that many of the by-laws against keeping pigs be held in abeyance during the war. The best step to take is to prevent kitchen waste. The suggestion is that the

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(6) Pub. Health Rep., July 6, 1917.
(7) Jan. 13, 1917.

sanitary inspectors inspect the garbage from households with a view to bringing some pressure upon those found to be unduly wasteful. But even after allowance for improvement in this direction has been made there is room for the development of pig-feeding as a means of garbage disposal. It is especially adapted to the requirements of hotels and institutions.

The digestive tract of a pig is adapted to much the same foods as is that of the human. It has no cecum for the conversion of large percentages of cellulose as is the case with herbivora. The growing pig is a typical omnivorus animal.

Using the pig as a middle-man, we find that 25 per cent. of the protein and 45 per cent. of the total energy is returned to the consumer as pork. We may say then that a pig charges a brokerage of 55 per cent. for converting vegetable protein and fat into meat protein and meat fat, and garbage into edible food. But high as is this brokerage it is less than that when any other method of garbage disposal is employed.

The least of all values of garbage is its heat value. Therefore, burning of garbage is always expensive and wasteful. The fat and fertilizer values are wasteful but less so than the fuel values. Therefore, garbage reduction works charge a lower brokerage fee than do incinerators and a higher one than do piggeries. The objection to piggeries is the offense which they cause. But a piggery can be so built, equipped, managed and policed that it will not be a source of nuisance. The suggestion of the English boards is that piggeries be allowed but that they be controlled. To these positions the *Lancet* accedes but advises that prevention of waste in the kitchen is even better.

Report on Sewage Disposal Methods. Attention is called to the "Reports on Sewerage and Sewage Disposal" by a committee of the American Public Health Association on this subject. The committee reports appear in the files of the *American Journal of Public Health.*(8)

Report on Street Cleaning. The Report of the Committee of the American Public Health Association, S.

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(8) October, 1917.

Whinery and others[9] states that street cleaning and work connected therewith is not an unhealthy occupation. There is no great danger to the public from street cleaning. Such harm as is done is due to dust. Dumps and landfills composed of street waste unmixed with garbage are not detrimental to health.

VENTILATION AND HUMIDITY.

Indoor Humidity. Flora[1] examined the humidity of air in an office building in Topeka, Kas., during the winter and compared it with the humidity of the outside air in various arid regions. The building was a well-heated and ventilated office building in which the temperature of the air was maintained at 72° F. He made three observations a day for a period of forty days. The average relative humidity was 23 per cent. The average out-of-doors humidity during the same period was 82. The average humidity during the dryest month of the year in several places is as follows: Yuma, Ariz., 35 per cent.; Santa Fe, N. Mex., 29 per cent.; Pueblo, Col., 38 per cent.

Factors in Good Ventilation. C. E. A. Winslow[2] gives us some observations on the working capacity of men under different air conditions. From this report by Prof. Winslow, and other reports appearing during the last year or two, it is possible to forecast the forthcoming report of the New York Commission on Ventilation.

Men working in an atmosphere containing 20 parts CO_2 and the usual accompanying quota of organic foulness were not harmed or inconvenienced provided the temperature and humidity were kept down. There was, however, a distinct diminution in appetite for food. It is to be noted that the experiment was not prolonged. On the other hand, warm dry air whether fresh or stale produced constitutional effects.

At a temperature of 75° F. and a relative humidity of 50 per cent. the rectal temperature of the subject rose

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(9) Amer. Jour. Pub. Health, October, 1917.
(1) Bull. Kans. State Bd. Health, January, 1917.
(2) Amer. Jour. Pub. Health, October, 1917.

0.36 degrees. At 86° F. temperature and 80 humidity it rose 0.9 degrees. The reclining pulse rate rose from 5 to 8 beats and the standing pulse rate from 12 to 17 beats. The systolic blood-pressure fell 2 mm., reclining and 7 mm., standing. The diastolic pressure fell from 5 to 7 mm.

The Crampton values indicated a progressively less efficient circulation with increasing temperature. The power to do physical and mental work was not decreased when such extreme conditions as 86° F. temperature and 80 per cent. humidity were reached but the disposition to work was lessened.

The optimum temperature for comfort was 68° F. At 75° F. the men began to comment "sleepy," "eyes smart," "less inclination to work," "lifeless," "drowsy," "more conversation than usual." Men doing purely mental work such as multiplying did as much work at 75° F. as at 68° F. Men doing typewriting did 6.3 per cent. more work at 68° F. than at 75° F. Men doing the heavier work such as dumbbell exercises and riding bicycles did 15 per cent. more work at 68° than at 75° F. and 37 per cent. more than when the temperature was 86° F.

Winslow using a katathermometer has shown that an outdoor temperature of 75° F. to 79° F. with a moderate breeze is more comfortable than an indoor temperature of 72° F. in a room with a fire.

He quotes at length as to the effect of climate on health from Huntington's "Civilization and Climate." Huntington's ideal climate is one with an average mean temperature of 59° F. and a range between a mean of 19 degrees for the coldest month and 73 degrees for the warmest, and with at least twenty storms a year. The areas therefore in which we would expect human energy to reach a maximum are Western Europe and Eastern North America, Japan, New Zealand and the tip of South America.

Men working on piecework earn maximum wages in the spring and autumn and minimum wages in midwinter and mid-summer.

PERSONAL HYGIENE.

Mouth Hygiene. Mitchell[1] says: At the dedication of the Research Institute of the National Dental Association in Cleveland in February, 1916, Dr. C. H. Mayo called the attention of the dental profession to that advance in preventive medicine which demonstrates that such acute and chronic diseases as neuritis, sciatica, acute paralysis, metastatic abscesses in liver, gall-bladder and appendix, stomach ulcers and bacterial infarcts result from entrance of bacteria into the body through root abcesses and pyorrhea pockets.

Kligler has shown that the mass of living bacteria which infest the mouth and collect on the teeth may number 600,000,000 per milligram. Of the many varieties composing this host of organisms streptococci, staphylococci, pneumococci and fusiform bacilli are liberal contributors. These organisms usually do not gain entrance to the system except through ulceration and abcess formation. Hartzell believes that infections enter through the gum crevices, veins and perivascular lymph spaces and root canals when these are opened by ulceration, decay or careless dental procedures. Danger of disseminating infection from pus pockets in root canals is so imminent that Dr. Rhein of New York after thirty-five years of root canal work admits he is almost prepared to say that extraction should be done whenever the canal is involved.

Tooth Pastes, Powders and Washes. The *Lancet*[2] gives the result of an examination of nineteen tooth powders, pastes, soaps and liquid washes not soaps. The powders were from 32 to 88 per cent. chalk, about 2 per cent. soluble alkali and from 1 to 10 per cent. soap or glycerine with aromatics. The pastes were composed of alcoholic solutions of soaps, from 30 to 55 per cent.; chalky ash, 11 to 36 per cent.; soluble alkali, about 2 per cent., and aromatics. The soap tooth washes contained from 70 to 80 per cent. soaps; from 13 to 20 per cent. chalky powder and 11 to 12 per cent. soluble alkali. The fluid tooth washes were alcoholic solutions of aro-

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(1) Southwest Jour. Med. and Surg., October, 1916.
(2) Jan. 6, 1917.

matics. In some instances the powders used in the different preparations were too coarse and gritty.

[The studies of the abrasive cutting action of various powders were far less complete than those conducted by the National Dental Society a few years ago.—ED.]

Study of the Normal Bacterial Flora of Postage Stamps. Keilty and McMaster[3] state that in order to determine the frequency with which pathogenic bacteria were found on postage stamps fifty stamps were purchased in fifty different places, placed in sterile test tubes, taken to the laboratory and there incubated in various culture media. In all except two instances bacteria of pathogenic type were found. This emphasizes the danger of licking postage stamps and emphasizes the necessity of having stamp-moistening devices provided, especially in postoffices.

CLIMATE AND HEALTH.

Favorable Climate for Tuberculosis. Trask[4] says that no locality has a climate that is favorable all the year and most localities in the United States have climates that are favorable for some part of the year. The best climate for a consumptive is one that is not too warm, where the humidity is low, the rainfall slight, where there are few cloudy days and where there are no wind or sand storms. While, generally speaking, altitude is of advantage, it throws an added strain on the heart. The consumptive can usually obtain the most favorable conditions for recovery including an outdoor life, suitable food, rest, medical care and nursing near his home. If a consumptive goes into a district in the southwest where high winds prevail in the spring he should get out of the locality during the windy seasons.

Blondes and Brunettes. Campbell[5] predicts that in the course of time blonde types will die out in the United States. This will be the result of climatic influence. The blonde races, he says, have overflowed to the south, carrying civilization and the spark of genius with them, but climatic influences have been too great and grad-

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(3) Med. Record, July 22, 1916.
(4) Pub. Health Rep., Feb. 23, 1917.
(5) Lancet, Feb. 3, 1917.

ually dark races have been evolved out of the blonde ones. All the presidents of the United States have had blue eyes. All the leading generals in this war—French, Haig, Joffre, Hindenburg and Mackenson—have blue eyes. Napoleon's eyes were gray. In spite of the tendency of the blue-eyed to dominance and invasion, the victory in time is by the type evolved by climatic influence. A blonde race may sweep over a land inhabited by a brunette people, but if they remain climatic influence will sweep over them and evolve a race of brunettes. While a blonde race may conquer the brunette people indigenous to a locality, the climate will conquer the blondes in time.

[Many of the conclusions reached by Campbell are in accord with those set forth by Grant in the "Passing of the Great Race." It is Grant's contention that a long-limbed, long-headed, blonde people have always dominated the world. When this race has wandered into lands where the climate was adverse to them they have died out, but the parent stock remaining in more favorable climatic surroundings has furnished new hordes for new invasions. In Grant's theory the blonde race is not evolved into a brunette one. It, rather, passes, so far as such localities are concerned.—Ed.]

INSPECTION OF SCHOOL CHILDREN.

More Adequate Inspection of School Children. M. H. Burnham[7] suggests that the time has come for making medical inspection of school children more adequate. The support of teachers and parents must be enlisted. To do this he suggests the advisability of a thorough physical examination of each school child at entrance upon school life. This examination should be made by the medical inspector, assisted by the teacher and one or both parents. Great good will comes from having both the teacher and the parents in attendance while the examination is being made. This examination should cover four fields: (1) A test of physiologic age; (2) a test of psychologic age; (3) a test of general health conditions; (4) a history of morbidity.

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(7) Jour. Amer. Med. Ass'n., March 24, 1917.

1. He suggests that the test of physiologic age establish such points as: the vital index (the lung capacity divided by the weight); the cardiovascular index (the systolic blood-pressure multiplied by the pulse plus the diastolic blood-pressure multiplied by the pulse); tests of the ability to form and break down the conditioned reflexes; tests of motor ability (Douglas and Dealey, Ped. Sem., 1916); studies of the physical type (Lewis, Ped. Sem., 1916); presence of six-year molars; determination of whether the child belongs to the carnivorous, herbivorous or neutral type.

2. Tests of the psychologic age should be much more complete and thorough than even the simple Binet-Simon tests. A very radical suggestion is that the first year or the first two years of school life be health years in which the teachers would be physicians and hygienists. In these two years the especial aim would be physical development, the teaching of correct habits and the doing of everything which would make for vitality.

The objects of the very thorough entrance examinations are:

1. To prevent those children who are in ill health or not sufficiently developed physically and mentally from entering.
2. To provide the necessary physical data to enable teachers so to order the school work that it will not result in injury to health or a check to development, as often happens in the first year of school life.
3. That proper grading and adaptation of school occupations to individual capacity may begin at the onset of school life.
4. To give school physicians the data necessary for safeguarding the health of children against contagious diseases and the like.
5. To give teachers proper knowledge of the new pupils and the right attitude toward them.
6. That children may begin right and be saved from unnecessary failure and retardation or elimination in later grades.
7. To educate parents and foster a right attitude toward the school.
8. To save the money of tax-payers, now largely

wasted, and so badly needed to provide for absolutely essential hygienic conditions.

Children who should be excluded from school are:

1. Those who have any infectious disease.
2. Children who have rickets, or the after-effects of rickets to the extent that they are in poor physical condition and liable to develop neuroses or some other defect from the influence of school work.
3. All children who have tuberculosis, unless there are outdoor schools in which they can be placed.
4. Children who are in a serious condition of anemia; unless, again, there are outdoor schools in which they can be placed.
5. Those who have any chronic disease which is liable to be aggravated by school attendance or would interfere with school work.
6. Those who are in a retarded stage of physiologic development or mental development, where this would be improved probably by keeping them out of school, and where injury would be done by admission to school, or where it would interfere with school work.
7. Those who have serious sense defects.
8. Those who have any neuroses or the like which would be psychically contagious, epilepsy, chorea, stuttering and the like.
9. Children who have not been vaccinated.

INFECTIOUS AND CONTAGIOUS DISEASES.

Mortality Rate of Contagion at Different Age Periods. Graham,[1] writing on the death-rate in acute infections, says: The fatalities from scarlet fever, measles, diphtheria, whooping cough and typhoid fever vary with the age of the patient and thus comparative mortality is best considered by division of the cases into ages.

Under one year: Whooping cough is most fatal follewed in order by measles, diphtheria and scarlet fever.

From one to two years: Diphtheria leads the list, followed my measles, whooping cough, typhoid fever and scarlet fever.

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[1] Jour. Amer. Med. Ass'n., Oct. 28, 1916.

From two to five years: Diphtheria is more fatal than all the others combined. Next comes scarlet fever, measles and typhoid fever, with whooping cough contributing but little to the total mortality.

From five to ten years: Diphtheria, scarlet fever, measles, whooping cough and typhoid rank in the order named.

From ten to fifteen: The order is diphtheria, scarlet fever, measles, whooping cough and typhoid.

From ten to fifteen years: Typhoid, diphtheria, scarlet fever, measles and whooping cough.

From fifteen to twenty: Typhoid, scarlet fever, diphtheria.

With respect to prevalence, measles leads all the others combined, while diphtheria, scarlet fever, whooping cough and typhoid follow in the order named.

TYPHOID FEVER.

Typhoidin Test. Gay and Lamb[2] hold that the value of the typhoidin test has been established. Those who react are immune to typhoid. Those who fail to react are susceptible. If after typhoid inoculation reaction is negative additional doses of typhoid vaccine should be given. The latest Force-and-Stevens modifications of the technique consist in introducing intradermically 0.00002 gm. of polyvalent typhoidin (from several chosen strains of typhoid bacilli) in 0.5 c.c. of 0.5 per cent. carbolated saline and judging the reaction 48 hours after the injection. Gay and Lamb found 75 per cent. of persons who had had typhoid from 2 to 22 years previously gave the reaction. The percentage of reactors among people who had been vaccinated within 18 months varied from 64 to 75 per cent. Among the 24 to 50 months group it was 53.8 per cent. In the 3 to 5 years group it was 40 per cent. Among those who had never had typhoid or been vaccinated it was 14.28 per cent.

Flies and Typhoid Fever. Nicoll[3] supplies some support for some of the weak links in the chain which binds flies to typhoid fever. Flies are far from being an

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(2) Jour. Lab. and Clin. Med., January, 1917.
(3) Jour. Hygiene, February, 1917.

essential factor in the spread of typhoid. Unlike the conditions which prevail with malaria and yellow fever there would be typhoid were there no flies. In order to incriminate flies as spreaders of typhoid it is essential that:

1. Persons infected with typhoid bacilli should provide material which may come in contact with house flies in some way or other.
2. This material should contain virulent typhoid bacilli.
3. These bacilli should be taken up by the flies from this material.
4. The bacilli should be able to exist and retain their virulence on or in the fly for a certain length of time.
5. The fly should be able to convey these bacilli to some other person or persons.
6. The bacilli when so transmitted should retain their virulence and be able to reproduce the infection.

That the first and second postulates are met is established beyond question. The extensive research of Nicolls bears on the third, fourth and fifth. He concludes:

1. Flies can ingest typhoid bacilli from feces and urine and carry them for a certain period of time.
2. Typhoid bacilli do not multiply in the fly. On the contrary they are not adapted to prolonged life on or in the house fly.
3. The house fly is purely a mechanical carrier of typhoid bacilli.
4. Many bacilli easily mistaken for *B. typhosus* culturally are common inhabitants of the intestines of flies.
5. *Bacillus typhosus* is rapidly eliminated by the intestines of the fly.

Epidemiology of Typhoid Fever. J. G. Cumming[4] reports an epidemic of typhoid fever occurring in a group of picknickers. There were twenty-nine persons at the picnic. Among the articles of food were two kinds of ice-cream. Seventeen ate chocolate ice-cream alone; eight ate both chocolate and vanilla and twelve ate vanilla only. Of those who ate chocolate ice-cream all but two, Mrs. Y. and her daughter, developed typhoid. Mrs. Y. had had typhoid fever seventeen years

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(4) Jour. Amer. Med. Ass'n., April 21, 1917.

before. Her daughter had been vaccinated. Her son and four boarders had had typhoid within a few years before the picnic. Mrs. Y. prepared the chocolate ice-cream in the morning, left the mixture in the freezer from morning until noon and then froze it.

The eaters developed nausea and vomiting the night of the picnic. These symptoms lasted two days. Four of the persons who ate chocolate ice-cream in quantities developed typhoid fever five days after the picnic; seven of the chocolate ice-cream eaters developed the disease on the sixth day; six who ate chocolate cream and one who ate chocolate and vanilla developed the disease on the seventh day. The other eaters of both chocolate and vanilla cream developed the disease, one on the eighth, one on the ninth, one on the tenth, one on the eleventh and one on the twelfth days.

It seemed that the briefness of the incubation and the intensity of the disease were dependent upon the dosage with bacilli. Those who ate abundantly of the chocolate cream got the larger doses and the more severe infections.

Typhoid bacilli were found in Mrs. Y.'s stools. Her blood gave a very inconclusive Widal reaction. The conclusion was that Mrs. Y. had been a carrier for many years. She had infected her own son and four others before she infected this group. Her method of making this batch of ice-cream caused it to be badly infected with typhoid. The intense dosage caused preliminary diarrheas, short incubation periods and intense infections, with a high case of mortality rate. Apparently no health officer or physician had had his suspicions aroused by the number of cases in this household.

In California at the present time typhoid carriers are allowed to go free provided they sign and keep the following agreement:

1. Not to take any part in the preparation or handling of any foods for persons outside of the immediate family. Not to participate in the management of any boarding house, restaurant or food store of any kind.

2. To disinfect the excreta with 5 per cent. phenol or 5 per cent. formaldehyde.

3. To notify the health officers of any case of typhoid among contacts.
4. To inform the health officer of any change of residence.
5. To submit specimens to the laboratory upon request.
6. Twice a year to report to the health department on a blank furnished for the purpose.

Typhoid and Vegetables. Melick[5] is of the opinion that vegetables may be a means of spreading typhoid fever of greater importance than is generally thought. He found that the typhoid bacillus would live in the soil for from thirty-two to fifty-eight days. The length of time it would live depended on the strain of the bacillus and on the nature of the soil. It survived longer in soil enriched with sewage than in a cleaner sand. Ordinary washing of vegetables does not sterilize them enough for safety.

MALARIA.

Survey of North Carolina. The Public Health Service[6] reports the result of a malaria survey of North Carolina made by Drs. Carter and Derivaux. This report indicates that the disease is at a minimum in February, rises gradually until April, then the curve runs sharply upward until June. There is a sharp drop in July, but in August and September the rate is as high as in July. From that time on there is a gradual drop to reach the February low level.

[With the last year similar studies of malaria in Tennessee, East Texas, Kentucky and Louisiana have been published in the *Public Health Reports.*—ED.]

The disease is most prevalent along the coast on the East. It is least so in the mountains of the West. The tertian variety of the disease is most prevalent, the aestivo-autumnal next and the quartan last. The value of the report is considerably lessened through the failure of 84 per cent. of the physicians to coöperate.

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(5) Jour. Infect. Dis., July, 1917.
(6) Pub. Health Rep., July 20, 1917.

Malarial Mosquitoes. Mitzmain[7] endeavored to valuate the importance of *Anopheles punctipennis* in the transmission of malaria at Talladega Spring, Alabama, between Sept. 18 and Nov. 15, 1916. He captured 1,377 specimens of *A. quadrimeaculatus* and *A. punctipennis* and examined many of them for malarial parasites. The largest number of punctipennis were caught in privies. Of the specimens collected in rooms less than 30 per cent. were *A. punctipennis.* They constituted 62 per cent. of those caught under houses. Those caught in houses were usually engorged with blood.

Carter, Le Prince and Ross[8] state that *A. punctipennis* rarely bites in bedrooms, but that it is apt to bite on porches, galleries and verandas and in the open. Specimens caught by Mitzmain up to September 29 contained well-developed malarial parasites. A specimen found in a mosquito caught November 15 contained parasites in an abortive stage of development, such as is noted in mosquitoes in the colder months. Many of these mosquitoes were caught in houses in which there were cases of malaria. In some there were several cases. The malarial incidence in 200 persons at Talladega was 18.6 per cent.

Mitzmain concluded that *A. punctipennis* was of considerable importance as a malaria vector, but that after the middle of November few people are infected.

Mitzmain[8] found that *A. punctipennis* was capable of acting as a vector for sub-tertian as well as tertian malaria. Mitzmain does not agree with Craig that each variety of the parasite is capable of transmission by a single variety of mosquito. He states that *A. quadrimeaculatus* may serve as a host for all three parasites: *A. punctipennis* and *A. crucians* for *vivax* and *falciparum.*

[This study shows the possibility of flight of anophelene mosquitoes. Two phases of the question must be borne in mind. First, of the many mosquitoes liberated but few were captured at any distance from the point of liberation. The probability that any given

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(7) Pub. Health Rep., April 13, 1917.
(8) Southern Med. Jour., 1916, p. 709.
(8) Pub. Health Rep., July 6, 1917.

infected mosquito will stay quite close to its feeding place and breeding is strong. Second, occasionally infected mosquitoes are transported long distances—for instance, by trains and boats.—Ed.]

Typhus Fever.

Scrotal Lesions in Experimental Typhus. Neill[9] reports a scrotal lesion in guinea-pigs injected with virus from typhus fever. The lesions are very similar to the scrotal lesions of Rocky Mountain spotted fever experimentally produced. Inoculation was done intraperitoneally. The virus was taken from Mexicans suffering with the disease. The lesions occurred in 70 per cent. of the animals inoculated.

Methods of Preventing Importation of Typhus. Pierce[1] gives the details of the method employed to protect the United States against the importation of typhus fever from Mexico. The precautions are based exclusively on the theory that typhus is conveyed solely through infected lice. It does not recognize ambulatory cases or carriers as sources of infection.

The immigrant is made to strip to the skin. The clothes are placed in two bundles. In one are placed the articles that can be heated without harm. In the other those that must be treated with cyanogen gas. The naked subject then passes before an examiner, who searches for lice. If lice are found on a male subject all of his hair is clipped with a No. 60 clipper. If on a female her head and hair are washed with a mixture of equal parts of kerosene and vinegar. The hair wet with these insecticides is tied up with a towel and left for one-half hour. The individual is next sprayed with liquid kerosene soap. This is made by boiling 1 part soap chips and 4 parts water and then adding 2 parts kerosene. This cools to a jelly. When this is diluted with water 1 to 4 liquid kerosene soap is made. Next the subject is bathed.

In the meanwhile the clothes are being treated by

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(9) Pub. Health Rep., July 13, 1917.

(1) Pub. Health Rep., Mar. 23, 1917. See also article by Mark Boyd, Practical Medicine Series, Vol. VI, 1917, p. 82.

steam at 250° F. They are placed in a vaccum chamber at 15 pounds pressure and then the steam is turned on and run up to 20 pounds pressure. This is maintained for ten minutes.

Shoes and other articles that can not be heated are treated with cynogen gas. Trunks and bedding are treated with the gas. The individual is given back his clothing and issued a certificate. This certificate he must keep with him.

The Iowa State Board of Health, in controlling a small epidemic of typhus at Fort Madison, Iowa, employed the same method except that they heated the clothing to 160 degrees for 20 minutes. They did not employ cyanogen gas.

The health authorities at El Paso, Texas, handle typhus as follows: When a case is diagnosed as typhus the attendants strip the patient, clip all hair from his person and give him a bath with kerosene soap and water. He is then wrapped in a kerosene sheet and taken to the hospital in an ambulance. All of his clothing is burned.

Methods of Killing Lice in Hair. Hall[2] says that lice can not be destroyed in heavy hair by mopping. He sprays a mixture of equal parts vinegar and kerosene into the hair and out to the scalp with a spray. The thoroughly wet hair is then wrapped in a towel wet with the same solution for one hour. Then the hair and scalp are anointed with vaseline and combed with a fine tooth comb. Next the head is washed with green soap and warm water. The kerosene kills the vermin. The vinegar loosens the eggs from the hair. The vaseline renders the fertile eggs non-fertile.

The body louse lives in the clothing and lays its eggs in the same place. In more than a thousand observations he has never found a body louse or its eggs on the body. Nevertheless, the rule is to have all persons with body lice bathe while the clothing is being sterilized. The clothing is best disinfected with hydrocyanic acid gas. This properly used is safe. It destroys all vermin and eggs. To make it add one ounce of sodium cyanide to two and a half ounces of hydrant water. Then add one

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(2) New York Med. Jour., June 9, 1917.

ounce of sulphuric acid. This makes enough gas to treat 100 cubic feet of space. Lice can live for thirty days away from the human body. They eat each other. They can be kept alive by feeding them raw beef.

Bacteriologic Studies. Baehr and Plotz[3] report that bacteriologic studies on the blood of 64 individuals in the Balkans and Russia show that *B. typi-exanthametici* is present in the blood during the febrile period. Up to date the organism has been found in pure culture in the blood in the United States, Mexico, Serbia, Bulgaria, Austria and Russia.

PELLAGRA.

Pellagrins Not Infective. Goldberger[4] failed to produce pellagra in sixteen persons who subjected themselves to an experiment to determine whether or not the secretions and excretions of pellagrins were infective. The blood of pellagrins was used in two instances; the nasopharyngeal secretion twice; scales, three times; urine and feces, six times. In most instances the supposedly infectious material was fed to persons whose stomach contents had just been neutralized by large doses of soda. The blood was injected intramuscularly and subcutaneously. In some cases secretions were applied to the nasal mucus membrane. Occasionally diarrheas and minor disorders developed, but in no instance was pellagra induced.

Intestinal Parasites in Pellagra. K. M. Lynch[5] found intestinal parasites unduly present in a series of cases of pellagra. Of a group of pellagrins, 86 per cent. had intestinal parasites as compared with 54 per cent. of a group of controls. The parasite most frequently found was *Blastocystis enterocola.*

Pellagra and Sewage. Siler, Garrison and McNeal[6] say that Spartan Mills, S. C., was converted from a pellagra focus to a community free from pellagra by the installation of sewage works. While old cases of the disease recurred for three years, new cases did not

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(3) Jour. Infect. Dis., February, 1917.
(4) Southern Med. Jour., April, 1917.
(5) Southern Med. Jour., April, 1917.
(6) Archiv. Int. Med., May, 1917.

occur. They recommend installation of sewage works as a means of controlling pellagra.

PNEUMONIA.

Bacteriology. Cole[7] continues his contributions to the bacteriology of pneumonia. Pneumococcus of Types I and II causes 65 per cent. of the cases of pneumonia. The mortality from pneumonia due to these organisms is from 25 to 35 per cent. Using the serum in Type I cases the mortality in 103 cases was 8. In the last thirty-three cases treated there had been but one death. The amount of serum required for each case is about 250 c.c. To get results, the diagnosis and use of serum must be prompt. A serum for treatment of Type II cases has been made, but it is not very effective. The bacteria of Types I and II do not remain long in the mouths of convalescents. Generally, they disappear in a few weeks, but in one case they have been found after eighty-three days.

Cole made a study of the bacteriology of the mouths of 942 normal individuals. In 450 of these, or 47 per cent., pneumococci were found. In 345 the cocci were of Type IV. In 56 of Types I or II. He examined 175 specimens of dust from houses in which pneumonia, due to Types I and II, had been present. In all the specimens but two the pneumococci found were of Types I and II. In sixty-two specimens of dust from houses where there had been no pneumonia, pneumococci were found 18 times, but in only one instance was the organism of Types I or II. In that case it was proved that a carrier had been present recently.

Type III includes the organism commonly known as *Pneumococcus mucosus*. These organisms produce only 10 per cent. of the pneumonias, but the disease is very violent, having a mortality of 50 per cent. In the throats of the 942 normal individuals this organism was found eighty-five times. In none of these cases was there any relation to cases of pneumonia. Type III gives specific immuniologic reactions. A serum prepared for this organism is of very poor curative power.

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(7) Amer. Jour. Pub. Health, June, 1917.

Type IV causes about 25 per cent. of the pneumonias. The mortality of this series of cases is from 10 to 15 per cent. This is the type or types of organism commonly found in the mouths of well people (345 out of 942 normal individuals). It is well nigh impossible to say whether this is a group of organisms or a single type. No serum for Type IV has been made.

Dr. Cole suggests that:

1. All cases of pneumonia to be reported.
2. All excretions be sterilized, especially sputum.
3. All houses in which cases have occurred be washed, scrubbed, aired and sunned after the cases have terminated.
4. The epidemiologic relation of cases should be determined.
5. The cases should be bacteriologically diagnosed and differentiated.
6. Serum treatment for the proper cases should be given.

Dr. Cole warns against unstandardized serums in the treatment of pneumonia. He says that 50 per cent. of cases of pneumonia occur in persons between 20 and 50 years of age.

[A few health departments are beginning to act on the information furnished by Cole and his collaborators. A few are making laboratory diagnoses of pneumonia and supplying curative serum. A few are asking that cases of pneumonia be reported. Many are advising mediary disinfection.—Ed.]

Determination of Type of Pneumococcus. Blake[8] says that the most satisfactory method for determining the type of pneumococcus is by the intraperitoneal injection of a mouse with the patient's sputum. The diagnosis of type is made directly on the peritoneal exudate. In a certain percentage of cases prompt determination is not possible either because of other organisms or the existence of abnormalities in the pneumococcus. To obviate the difficulty where the coccus gives a cross agglutination reaction, Blake recommends that particular attention be paid to the dilution of the serum. Serum I should be used 1:20. Serum II, 1:20. Serum

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(8) Jour. Exp. Med., July, 1917.

III, 1:5. For sub-group II, pneumococci Type II, serum is used undiluted. To obviate the other difficulty the precipitin method is used in addition to the agglutinine method.

TUBERCULOSIS.

A Tuberculosis Program. White[9] writes that the work against tuberculosis has suffered somewhat because it has not coöperated sufficiently with other health agencies. Tuberculosis work must be regarded more as general health work to be effective. He recommends that equipment against tuberculosis be organized on the following basis: For each 100,000 population there should be a hospital with 200 beds, a dispensary and an open-air school. There should be fifteen nurses, of whom five are visiting social-service nurses. There should be four or five physicians. Such a unit should expand and care for all public health activities, such as child welfare, pneumonia, syphilis and other health and public welfare problems.

A Tuberculosis Program for France. Guinon[1] informs us that as a result of the war France has undertaken a far more comprehensive plan for combating tuberculosis than prevailed prior thereto.

[For the period of the war France has nationalized medicine. Everyone in the Republic, I am informed, receives medical service from the state. All medical men are paid by the state. No medical man is assigned to the district in which he practiced as a physician prior to the war.—Ed.]

He suggests a scheme for social prophylaxis. A visitor goes to every home in which there is, or recently has been, a case of consumption. The disease history of every person in the family is taken. These records are kept on cards—one for each individual. If there is any reason to suspect tuberculosis in any one that person is examined physically, and if necessary by *x*-rays and a sputum examination is also made.

For the children who have been exposed and are found

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(9) Amer. Jour. Med. Sci., December, 1916.
(1) Presse méd., Jan. 22, 1917.

to be tuberculous or below *par* the following plan is proposed:

(*a*) The committee can and ought to find a house, a larger, lighter and more sanitary house, where the consumptive can have a bed to himself.

(*b*) Better food should be provided.

(*c*) The committee should furnish medicine as needed, also thermometers.

(*d*) There should be visiting nurse and medical service.

(*e*) The children who have enlarged glands should be sent away once a year for several months or, better still, twice a year for one month at a time. Since the close contact and the bad ventilation of winter makes that the time of maximum danger, one of the vacations should take place in that season.

[Subsequent to the report by Dr. Biggs in which the alarming prevalence of tuberculosis in France was forcibly set forth a tuberculosis commission was sent to that country by the International Health Commission.—Ed.]

Conjugal Tuberculosis. Fishberg[2] holds that conjugal phthisis is rare. In an examination of 170 married couples he found only 2.9 per cent. in which both husband and wife were actively tuberculous. In his opinion this does not prove that tuberculosis is not infectious. It is due to the fact that practically all adults are infected with tuberculosis and that while with them the disease is latent it serves to protect against an exotic infection. The few cases found are to be regarded as illustrations of coincidences rather than as cause and effect.

Tuberculosis and Tuberculin. Newton[3] asks: Shall we get rid of tuberculosis at last? He considers the designation of the so-called pre-tuberculosis stage a misnomer.

At present, with better technique and a better understanding of the chronicity of the disease and the resulting necessity of prolonged treatment better results are being obtained with tuberculin, and we are tending toward a tuberculin renaissance.

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(2) Amer. Jour. Med. Sci., March, 1917.
(3) Med. Record, Nov. 11, 1916.

Attention is called to the chronicity of tuberculosis; 70 per cent. of persons are infected before the age of 17. Of this large percentage infected, few, approximately one-eighth, develop active foci, thus showing the natural resisting powers of the organism. It is therefore argued that a little aid to this natural resistance in the early stages would carry the advantage to the side of the individual and result in cure. This is being done in the Polyclinic Medical School and Hospital of New York. Diagnosis of the presence of the disease in the early stage is made with tuberculin, hypodermically, as in cattle. In the presence of a positive reaction, treatment is instituted. This consists of very small injections of Koch's tuberculin under the skin twice a week. The patient need not stop work or go to bed, hence thousands can be reached by this method where but few can be reached by sanitoria.

Care of the Tuberculous. Shoulders[4] discusses a state program against tuberculosis. He emphasizes the predisposing etiologic factor of lowered resistance, produced by heredity, environment and the after-effects of acute infections. He considers that more can be accomplished by bettering the environment than by efforts directed to control the spread of infection from infected persons. This affords two points of attack to the problem, *viz.*, curtail the spread of infection and build up individual resistance. The sources of infection are the advanced cases. Theoretically, isolation of these advanced cases is valuable in preventing the spread of infective material, but its value might easily be overestimated, as the other members of the family of advanced cases are probably infected before isolation. Hygienic education in an isolation hospital affects only the patient and usually is not imparted by him to others. A plan as follows is proposed to procure isolation and education. This is accomplished by:

1. State-provided isolation porches for advanced cases.
2. Attendance upon the family of a trained nurse for six weeks, (*a*) to educate the patient in the care of himself and the protection of others, (*b*) to educate the

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(4) Lancet-Clinic, Sept. 9, 1916.

rest of the family, some of whom may be incipient cases, as to preventative hygiene, and (*c*) to impress the neighbors with the imminence of tuberculosis and the necessity of hygienic care. For $160,000 (the amount estimated as necessary to build a sanitarium of 100 beds and maintain it for one year) 800 advanced cases could be isolated and educated. The education would extend to 4,000 other members of their families who are possibly infected cases.

Tuberculosis in Children. Ravenel[5] says that Eastwood and Griffith found that 21 per cent. of 261 cases of bone tuberculosis showed bovine bacilli. The age distribution of these cases shows that the danger is greatest in the early years of life. He thinks that further studies which will take into consideration the relative proportion of human and bovine infection will show that adults are infected with the bovine tubercle bacilli relatively as frequently as with the human.

Mitchell, studying the Edinburg milk supply, found that 20 per cent. of the samples were infected with tubercle bacilli. DeBesche found one case infected with both human and bovine bacilli. He says: "In animals it has been conclusively shown that pulmonary tuberculosis can be easily produced both by feeding and by injection of tubercle bacilli directly into the stomach, producing this type of disease and the oldest lesions in this part of the body by an infection of known intestinal origin. It seems almost certain that the same thing may take place in children."

HAY FEVER.

Hay Fever in Louisiana. Scheppegrell[6] says that a questionnaire sent out by the Public Health Service in Louisiana showed that 0.99 per cent. of the people in that state suffer from hay fever. The probability is that the hay fever rate is lower in Louisiana than in other parts of the Union.

The hay fevers of the Pacific and Rocky Mountain

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(5) Archiv. Pediat., February, 1917.

(6) Interstate Med. Jour., June, 1917. See also Practical Medicine Series, Vol. III, 1917, pp. 283-284.

states are due principally to sage brush. The principal cause of the autumnal hay fevers in the Eastern and Southern states is the common ragweed. The grasses are the principal causes of the disease in spring and summer.

The difference in the size of the pollen grains determines the difference in the distance which the wind carries the disease or its cause. The pollen grains of ragweed and sage are small (15 microns) and light and, in consequence, are borne for miles or more by winds of twelve miles an hour or over. The pollen grains of the grasses are large (80 microns) and, in consequence, they are not wind-borne ordinarily to greater distances than one mile. Weed and grass ordinances are especially valuable, therefore, against spring hay fever. They have some value in controlling all varieties.

It is, of course, to be borne in mind that two other factors are of consequence. First, individuals vary in their sensitiveness to the pollens. Second, the dosage of pollen granules must be considerable in order to induce the disease.

Among the cities which have reduced the hay fever of their people by grass and weed ordinances are New Orleans, Jacksonville, Fla., Charlestown and Philadelphia. In New Orleans the spring hay fever has been reduced more than 50 per cent. according to Dr. Scheppegrell.

Scheppegrell[7] found hay fever quite prevalent in the West, as well as in other sections of the country where the presence of the disease is better known. The states where the disease was reported quite prevalent were California, New Mexico, Washington, Arizona, Wyoming, Utah and Nevada. In these states, as elsewhere, the disease had two seasons. In California, vernal hay fever is due to Johnson grass, Gailleta grass, crab grass, Bermuda grass and a dozen other grasses. The summer varieties are due to sage brush and mugwort principally. In Oregon, the vernal variety is due to sweet vernal grass, velvet grass, brome grass, orchard grass, rye grass and blue grass. The summer variety is due to the *Artemesias*. In Washington the plants responsible are

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(7) Pub. Health Rep., July 20, 1917.

about the same as in Oregon. In Wyoming the vernal type is due to Western wheat grass, hair grass, blue grass, timothy and several other grasses. The grasses principally responsible in Arizona, New Mexica, Idaho, Nevada and Utah are wild-oat grass, long Hungarian, brome grass, long-awned grass, sleepy grass, false oat grass, Western wheat grass and other tall wheat grasses.

The most important producers of summer hay fever are sage and wormwood. There are some sections in which there is ragweed. Golden rod and rose pollen do not cause either vernal or summer hay fever.

To produce hay fever the pollen must be air borne. The size of the pollen grain determines the distance that the cause of the disease will be carried.

Hay Fever and Asthma. Chandler Walker[8] says that the cutaneous reaction is the safest and best guide in testing for the cause and treatment of bronchial asthma. Serum agglutination tests and cultures from the nose and throat are of little value. In determining the cause of hay fever or seasonal asthma the patients should be tested with the pollen of all the common plants. In some cases it is necessary to test with the leaves of trees rather than with the pollen.

DIPHTHERIA.

Diphtheria in an Institution. S. Rabinoff[9] was called upon to control an epidemic of diphtheria in an institution holding 400 children under 5 years of age. In addition to proper care of the cases the children were given the Schick test and throat cultures were made. The carriers were placed with the immunes in a dormitory apart from that which house the susceptibles. Efforts to clear up the carriers by using silver preparations, formaldehyde, iodine and iodinized phenol were ineffective. Fuller's earth blown into the nose three times a day with a powder-blower was somewhat more ineffective. Fuller's earth blown into the nose three the removal of tonsils and adenoids. Following tonsillectomy the patients ran the usual post-operative course.

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(8) Jour. Med. Research, May, 1917.
(9) Jour. Amer. Med. Ass'n., Dec. 9, 1916.

A sidelight is thrown upon an unexpected finding. Five of the carriers had shoe buttons in their noses; when the buttons were removed, the bacilli cleared out; a certain proportion of cases spontaneously cleared up.

Virulence of Diphtheria Bacilli. Weaver[1] says that diphtheria bacilli from patients with diphtheria and from carriers who have been in contact with cases are practically always virulent. The bacilli in such cases remain virulent up to the time of disappearance from the throat. Carriers should be kept in isolation until the bacilli have been gotten rid of.

Distribution and Death-Rate. Crum,[2] as the result of a statistical study, concludes that diphtheria is as prevalent from the viewpoint of its world distribution as it has ever been in the past. The number of deaths and the death-rates from the disease have decreased all over the world. The decrease in ten cities in the United States has been from 120.1 per 1,000,000 population to 93. Decreases in other countries are: Prussia, 143.1 to 22.6; England and Wales, 30.9 to 13.2; France, 64.3 to 8.3; Australia, 49.5 to 15.2; Holland, 28.1 to 7. As against this, however, the disease is spreading geographically and tending to become endemic in the remoter sections of the earth.

Antitoxin is a cure. The Schick test and the von Behring method of vaccination are efficient aids in the control of the disease, but many of the underlying factors, such as climate, temperature, rain-fall, altitude, drainage, are but little understood.

Negroes are relatively little susceptible to the disease, but the death-rate among those who have it is high. The diphtheria death-rate in the United States becomes high as we travel from the South, North and from the West to the East.

In 1,000 cases, albuminuria was present in 250.9; paralysis in 124.4; otitis in 48.1; and other complications less frequently. One thousand people of all ages who died from diphtheria were divided as follows: Less than 1 week old, 1.8; less than 1 month, 7.5; less than a year, 78.4; one year, 161.4; two years, 150.4; three years,

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(1) Jour. Infect. Dis., February, 1917.
(2) Amer. Jour. Pub. Health, May, 1917.

132.6; four years, 103.2; five to nine years, 253.7; 10 to 19 years, 79.3; over 20 years, 8.

The disease is essentially one of childhood (between two years and school age). The urban death-rate, Crum says, is being so well controlled by antitoxin treatment that it is probable that it will soon be no more than equal to or lower than the rural death-rate. The figures show, as has so frequently been shown before, that antitoxin to be of service must be given early in the disease.

SEPTIC SORE THROAT.

Etiology. Smillie[3] found the beta-hemolytic streptococcus in the Dorchester milk epidemic. However, it was also found in sporadic cases of tonsillitis as well. He concludes that epidemic tonsillitis is due to other causes as well as to milk. The virulence of the disease is not an index of its origin. The above-mentioned streptococcus is often found in the throat in cases of scarlet fever and may remain for months in the ear discharges. This explains how milk may be infected from scarlet fever and in turn produce an epidemic of septic sore throat and not one of scarlet fever.

[Attention is called to the large amount of diphtheria in the United States as compared with that in various European countries.—ED.]

SCARLET FEVER.

Streptococci of Scarlet Fever. Lewis[4] came to the conclusion years ago that in milk sedimentation work a certain streptococcus with a certain morphology meant garget, even though there were but few pus cells in evidence. He, therefore, concluded to look for the same sign in ordinary tonsillitis, scarlet fever and measles. He asserts that the streptococcus shown in the upper right third of the circle means scarlet fever; that in the upper left, measles; and that in the lower segment, ordinary tonsillitis. He cultures all hyperemic throats in schools where scarlet fever prevails. He has found

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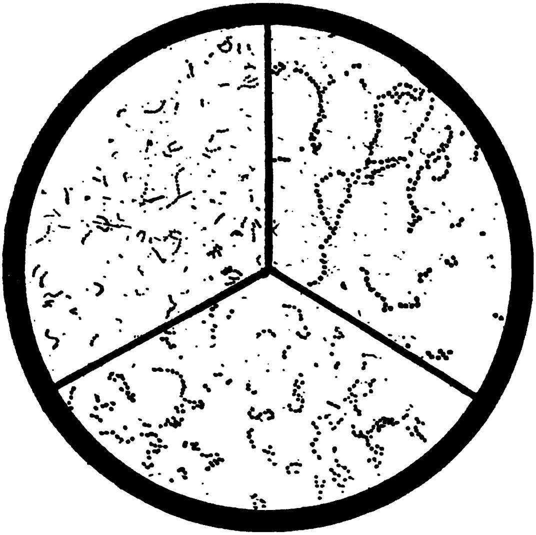
(3) Jour. Infect. Dis., January, 1917.
(4) Boston Med. and Surg. Jour., Feb. 1, 1917.

the method successful in controlling endemics of the disease (Fig. 13).

[The controversy as to whether the streptococci responsible for septic sore throat are derived from diseased udders or get into the milk from human throats is still under way. There is proof that they may come from either source.[5]—Ed.]



Oil im. 1/12 } Leitz.
Ocular 4 }
Fig. 13. Camera Lucida.

SMALLPOX.

Acupuncture the Best Method of Vaccination. H. W. Hill[6] advocates a new method of vaccination proposed first by J. J. Kinyoun and now adopted by one division of the Canadian Army. The advantages of the method are rapidity of performances, protection afforded against secondary infection and absence of pain and inconvenience.

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[5] See also pages 255 and 261-262, this volume.
[6] Amer. Jour. Pub. Health, March, 1917.

Vaccination by this method is done in 20 seconds. In a series of sixty vaccinations less than 1 drop of blood was drawn. Since no epidermis is removed there is no sore, no ulcer and no easily infected area. The skin is prepared in the usual way. An ordinary sewing needle is sterilized and used to vaccinate with. A drop of vaccine is placed on the arm. The needle is held almost parallel with the arm. Diagonal punctures part way through the skin are made. The punctures are not over one-thousandth of an inch deep and do not completely traverse the skin. Twenty or more such pnnctures are made in a space one-sixteenth of an inch square. The punctures are made through vaccine. The vaccine is next wiped from the arm with absorbent cotton. This is the end of the process. No dressing is applied. It is advised to vaccinate by this method in three separate places on the arm.

If the vaccination fails to take because of a natural immunity or because the vaccine is inert nothing happens. If the vaccinated person has had smallpox or is immune by reason of previous vaccination anaphylactic phenomena show themselves within a day. The vaccinated spot reddens, swells slightly and becomes itchy. If the vaccination takes it becomes red and swollen five days after the vaccination. The puncture spot shows as a swollen, shiny tubercle the size of a large pea. In ten days this will shrink and become a dark, dry button. In ten days more this will separate out, leaving a small round area. During the height of the reaction there may be a red areola and the axillary glands may enlarge.

Vaccine Virus. Public Health Reports[7] warn against the usual method of keeping vaccine points employed in drug stores and physicians' offices. Vaccine as it leaves the manufacturer is practically always potent. The same vaccine when obtained from druggists and physicians is rarely more than 50 per cent. potent. Druggists who do not keep vaccine in ordinary drawers keep it in a refrigerator or in a soda fountain cooler. These places are usually around 59° F. This is not

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(7) May 11, 1917.

cool enough. Vaccine will not remain potent except it be kept on ice.

Variola Organisms. Horace Greeley[8] has been able to culture a minute bipolar bacillus from vaccinia, variola and varicella by making use of pure hydrocele fluid in hanging drops hermetically sealed. Later he found that a mixture of bouillon, 50 per cent., and distilled water, 10 to 100 per cent., saturated with calcium oxide, made a satisfactory medium. The specific agglutination and complement-fixation tests with variola indicates, in the opinion of the author, that this organism was specific.

CEREBROSPINAL MENINGITIS.

ESPECIALLY IN BRITISH ARMY.

Tests for Meningococci. Eastwood[9] says that it has been definitely settled that organisms indistinguishable by all known methods from meningococci occur in the nasopharnyx of persons who, so far as is known, have not been in contact with cases of cerebrospinal fever. He does not think it is possible as yet to group these organisms.

Griffith[1] says that all strains of Gram-negative cocci obtained from the nasopharynx identical microscopically culturally and in fermentation tests with meningococci must be regarded as meningococci.

Scott[2] says that serologic tests for meningococci are fairly satisfactory, though they are not standardized. Meningococci may remain in the nose of a convalescent more than three months. Meningococci from the nasopharynx proved identical with the organism.

Existence of Filterable Virus. Hort and Caulfield[3] confirm the opinion of Hort that there is a filterable virus in cerebrospinal meningitis which is capable of producing the disease. In all the cases providing material, meningococci were present at some time during the course of the disease. They used material collected

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(8) Med. Record, Aug. 12, 1916.
(9) Jour. Hyg., September, 1916.
(1) Ibid.
(2) Ibid.
(3) Brit. Med. Jour., Oct. 14, 1916.

from a large number of cases of meningitis and injected about 150 monkeys. The demonstrable effects of monkeys inoculated with this virus always included continued fever or death. In no case did injection cause the cardinal feature of the disease as it occurs in man: *vis.*, demonstrable involvement of the cerebrospinal system. The pathogenicity to monkeys of cerebrospinal fluid from cerebrospinal fever varies inversely as its meningococcal content.

The cerebrospinal fluid in meningitis sometimes contains a filter-passing agent which is not the meningococcus, but which is nevertheless capable of producing in monkeys continued fever or death. This filter-passing agent appears to be a living virus eapable of cultivation in the laboratory and of passage through monkeys. None of the pathogenic results noted in the monkeys can be reasonably attributed to the action of living meningococci or to the direct or indirect action of a toxin.

Types of Meningococcus. Kennedy and Worster-Drought[4] found four types of meningococcus in cases of meningitis. The types are relatively immutable. Type 1 was the most violently pathogenic. In segregating contacts it is only necessary to segregate those carriers with cocci of the type found in the case in contact.

Spread and Control of the Disease. S. Flexner[5] says that the meningococcus is unknown in Nature outside of the human host. The organism is kept alive by chronic human carriers. The chronic carriers infect cases and secondary carriers and thus the disease spreads. The organisms enters the body by the mouth or nose and from the mucous membrane of these cavities reaches the central nervous system either by way of the lymphatics or by the blood-stream. The former is the more frequent route. The organism multiplies on the mucous membrane. Infection of the meninges may occur soon after the organism reaches the nose, or it may not occur for some days, weeks or months thereafter.

The danger from a carrier is greater than that from a case. The coccus is sprayed into the air and thus

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(4) Brit. Med. Jour., Feb. 24, 1917.

(5) Jour. Amer. Med. Ass'n., Aug. 25 and Sept. 1, 1917.

reaches other hosts. It may be carried on the bodies of flies. It dtoes not live long outside the human body.

Carriers or individuals with a cough are more dangerous spreaders of the contagion than persons free from cough.

In order to swab the nasopharynx without contaminating the swab with saliva a West tube is passed through the mouth and behind the palate, whereupon the swab is extended and the nasopharynx is swabbed.

After the plates have been inoculated they must be kept warm. The organisms will not grow satisfactorily if the plates are allowed to cool down. The medium used for the first inoculations is glucose-agar, to which sheep-serum has been added. The medium can be used in plates or slants. It must be kept moist. To this medium litmus is frequently added. On this medium the meningococcus assumes a pink tint. The organism is Gram-negative. Considerable experience is required to pick out the colonies of meningococci from the other organisms growing on the surface.

The final test of the meningococcus is its agglutination by a polyvalent horse serum.

Flexner thinks there are two fixed types of meningococci and several less well fixed. Both monovalent and polyvalent curative sera are employed.

Flexner thinks with three or four trained bacteriologists, trained technical help and a sufficient stock of culture media large military commands can all be examined bacteriologically in a few weeks without disturbing the military routine. He quotes an instance in which 10,000 English troops were examined in a short while.

The average duration of infectivity of a certain group of carriers was 4.65 weeks and of another group, 3.68 weeks. In one of these groups 20 per cent. of the infected noses ceased to carry bacteria in two weeks; 52 per cent. within four weeks, while 5 per cent. where infective longer than twelve weeks. He cites one example of a carrier who spontaneously ceased to be a carrier after fifteen months.

In the clearing up of carriers Flexner says that the sniffing through the nose twice a day of a 1 per cent. solution of chloramin with gargling of the throat with

0.1 per cent. permanganate solution will clear up the carriers who have but few cocci in their noses. If the membrane is badly infested the spray method must be employed. The chemicals used for vaporizing were: 2 per cent. chloramin-T, and 1.2 per cent. zinc sulphate. The former was the more effective. He quotes with approval Dunham and Dakin's[6] dichloramin-T in oil method of sterilizing the nose:

1. The nose is cleared with salt solution or 0.25 aqueous chloramin-T solution either by spraying or irrigation. The nose is blown into a handkerchief between applications. The dichloramin-T solution is used as a gargle.

2. When the increased flow of nasal secretion has subsided the oil solution of dichloramin-T solution is applied with an oil atomizer. The oil spray should be repeated at intervals so as to make four applications daily spaced about evenly. The spraying should be thorough. All parts of the membrane must be reached. There may be a little sneezing at first, but it only persists for a short while. It would be out of place to give the details of the manufacture of dichloramin-T oil here. The dichloramin-T oil should not be used after it shows a precipitate. The ready-to-use oil will only keep a few days. A stock solution in eucalyptus will keep a month.

In examining a military establishment a single bacteriologic examination will release 70 per cent. of the command as not being carriers. This only takes forty-eight hours. Most of the remaining 30 per cent. will be released on an agglutination test which takes one more day. About 5 per cent. in many instances will remain as carriers to be cleared up by treatment of the nasopharynx. Convalescents should not be released from quarantine until two negatives are given taken at four-day intervals. The institution of bacterial termination of quarantine saves the time of the soldiers by shortening the period of quarantine.

The diagnosis of meningitis is based upon lumbar puncture and examination of the fluid, bacteriologic examination of the nose secretions and the symptoms. Upon the development of violent headache, rigidity of

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(6) Brit. Med. Jour., 1917, p. 682.

the muscles and back, pain and tenderness upon forward bending and other symptoms indicative of meningitis, a culture should be made of the nose secretions and a spinal puncture is done. If the fluid is at all turbid the diagnosis is probably cerebrospinal meningitis. The fluid, whether clear or turbid, is centrifuged at once. A leukocytosis is very suggestive of meningitis. Smears are made and stained for meningococci. The fluid is tested for excess of globulin by the Noguchi method. If the fluid is turbid or there is leukocytosis or meningococci are demonstrated or an excess of globulin is shown 30 c.c. of fluid more are drawn off and serum is injected. The fluid and the nose secretions are cultured for meningococci.

This examination can be completed in twenty-four hours. If the diagnosis is confirmed another dose of 30 c.c. of serum is injected. The ordinary dosage of serum is 30 c.c. every twenty-four hours for about four days. This dose can be given once every twelve hours, or the dose may be increased to 60 c.c. if the infection is severe or obstinate. A quantity of cerebrospinal fluid a little in excess of the dose of serum to be injected is drawn before the injection. The use of serum lessens the death-rate materially and decreases the complications with the exception of involvement of the internal ear and shortens the duration of the disease. If there is over-distension of the lateral ventricles producing hydrocephalus it will be necessary to inject the serum into the ventricles to get its effects.

Clinically, meningitis is divisible into three types—fulminant or hemorrhagic, abortive and ambulant. The division of cases between these groups varies in different epidemics and in the course of the same epidemic.

Culture Media. Lloyd[7] concludes that culture medium for meningococcus needs some digested protein and a comparatively high concentration of vitamines. The protein substance can be derived either from blood serum, milk or eggs and the vitamines from pea flour (Gordon and Hine, *British Med. Jour.*, Nov. 18, 1916), or starch (Vedder). Secondary subcultures will grow on vitamine free media if they are amido

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(7) Brit. Med. Jour., Jan. 6, 1917.

rich. For growth in this stage the best medium is Cole and Onslew's,[8] consisting of tryptin digested casein. Another requisite for good growth is a moist atmosphere.

Douglas[9] advises that in inoculating for meningococcus the culture media be first warmed to 36 to 37° C.

Technique of Culture Media. Feldes[10] gives the technique for the preparation of culture media for meningococcus. Since such media require a considerable proportion of somewhat digested proteid sterilization is somewhat difficult.

Treatment. Robb[1] states that the intrathecal injection of lysol and protargol in cerebrospinal meningitis does harm. Sub-cutaneous injection of meningococcus serum is of doubtful value he thinks. The keystone of treatment of this disease is spinal drainage early enough and the intrathecal injection of serum. In Robb's series of forty-eight cases the average number of injections was four. The average quantity injected was 90 c.c. The largest quantity injected was 280 c.c. Of twelve soldiers treated two died. He had a death-rate of 28 per cent. Gray had a death-rate of 9.09 per cent. in thirty-three patients treated before the third day.

Worster-Drought[2] says that the average mortality of cerebrospinal fever prior to 1905 was 80 per cent. The death-rate among cases using the latest Lister Institute polyvalent serum is about 35 per cent. The author calls attention to reports by Gaskell and Foster and Morgan, who had from 30 to 40 per cent. mortality. There is some evidence of efficacy in the use of autogenous vaccines. Chemical substances are ineffective when injected intraspinously.

Worster-Drought[2] says that it is not necessary to anesthetize to make lumbar puncture. His treatment is as follows:

At the earliest possible moment he makes a spinal puncture, withdraws 35 c.c. of fluid and injects 30 c.c. of Lister polyvalent serum. This is repeated every day

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(8) Brit. Med. Jour., July 1, 1916.
(9) Med. Jour. Austral., Nov. 4, 1916.
(10) Lancet, March 3, 1917.
(1) Brit. Med. Jour., April 14, 1917.
(2) Brit. Med. Jour., Nov. 18, 1916.

until the clinical symptoms are materially better. The injections are never given for less than four days. He does not wait for bacteriologic diagnosis. The death-rate where the injection was given on the first day was 0. On the second day, 15.6 per cent.; on the third and fourth days, 50 per cent. The technique is as follows:

The upper end of an india-rubber tube about 18 inches long is attached to a small glass funnel, the lower end being secured to a tubular piece of metal with a prolongation which fits into the spinal needle. The barrel of an ordinary hypodermic syringe, provided it fits the lumbar needle, will serve for the lower attachment equally well. About three or four inches from the lower end a small piece of glass tubing interrupts the continuity of the rubber tube to act as "window," a metal slip being between this and the attachment fitting into the needle. Having sterilized the whole apparatus by boiling, the tube and part of the funnel is filled with a sterile saline solution; the clip is then released, and the saline allowed to escape, in order to displace the air, until its upper level reaches the tube of the funnel. Serum warmed to body temperature is then poured into the funnel, and the clip again released until the serum, known by its yellow color, is seen at the "window." Finally the metal insertion is placed in the spinal needle, and the serum allowed to flow in.

If the patient is straining, the inflow may be very slow indeed and scarcely discernible; he may also complain of considerable pain and "cramp" in the legs caused by the sudden rise of pressure acting on the spinal nerve roots. When the needle was between the third and fourth lumbar vertebrae, the site of pain most frequently indicated was down the front of the legs, the spasm was probably due to stimulation, by the inflowing serum, of the roots of the anterior crural nerve issuing from the third and fourth spinal foramina. On the other hand, when the puncture was made between the fourth and fifth vertebrae, pain was usually experienced in the back of the leg, and the hamstring muscles could be both seen and felt to twitch. This was evidently owing to pressure on the upper roots of the great sciatic nerve while on their way to the fourth and fifth foramina.

Brown[3] thinks that the low death-rate from cerebrospinal meningitis in Melbourne was due to the intensive use of serum. The death-rate in one series was 9 per cent.; in another, 12 per cent. All cases receive two injections of 30 c.c. of serum within eighteen hours. The usual interval was twelve hours. The injections were given at least once a day for at least five days. They withdrew from 50 to 75 c.c. of fluid, as much as they could without symptoms, and in some instances they injected 60 c.c. of serum at a dose. Sometimes serum was also given subcutaneously. The nose was washed with peroxide. At the height of the epidemic all persons having nasal catarrh were asked to report; 5.8 per cent. were found to be meningococcus carriers. Three hundred and forty-three contacts were examined; 14 per cent. were found to be carriers.

Bacteriology, Clinical Diagnosis and Pathology. Denehy reports on 368 cases of epidemic cerebrospinal meningitis, most of which were seen in a military population. He says that in the examination of suspected cases the examination of cerebrospinal fluid is all important. If the fluid is found turbid the patient is admitted to the meningitis hospital without delay. Accepting a turbid cerebrospinal fluid as positive proof has led to several mistakes. On the other hand it is possible to make the diagnosis before the fluid becomes turbid.

In the very early stages mononuclear cells are rather prominent in the cerebrospinal fluid. The fluid is tested for clotting. This is frequently in an early stage fluid. Excess of globulin is a frequent sign. The best test for a fluid that is not yet turbid is the potassium permanganate test of Luridie.[5]

The test is made as follows: A solution of potassium permanganate (1 in 1,000) is poured from a measure into 1 c.c. of fluid. The purplish color is changed at once to brown. The solution is added until the mixture remains purple for three minutes. Fluid from severe

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(3) Med. Jour. Austral., Dec. 9, 1916.
(4) Brit. Med. Jour., Nov. 18, 1916.
(5) Ibid, May 15, 1915.

cases required from 7 to 11 cm. to be added before the purple color persisted.

This Luridie test can not be applied if the fluid is bloody. It is especially adapted to diagnosis at a stage where the fluid is still clear. The fluid is centrifuged before being tested. A negative permanganate test does not exclude meningitis. In this epidemic, cases with clear fluid were admitted to the hospital on the strength of this test alone and later developments justified the diagnoses.

Denehy was able to find the meningococci in 82 per cent. of 700 cerebrospinal fluids from cases of spinal fever. In 80 per cent. of the cases the great bulk of the cocci were within the cells. Where there was difficulty in finding the organisms Denehy incubated the fluid at 37° C. for from twelve to twenty-four hours. The organisms multiplied enormously. In his experience the presence of a large proportion of extra-cellular organisms indicated a bad prognosis. Opalescence in a fluid not due to blood was generally indicative of the presence of diplocci.

Denehy found that it was very necessary that cerebrospinal fluid should not be cooled if it was to be cultured. The best plan was to inoculate with it while it was yet warm or else to incubate it at 37° C. from the time of removal until time to inoculate it. It grows readily on 3 per cent. glucose agar, blood serum, ascitis agar and ascitis glucose agar. When the fluid was kept warm before it was cultured good growths were obtained in from fourteen to sixteen hours. Using these methods he was able to get cultures in 70 per cent. of cases.

The presence of blood in the fluid indicates a tendency to hemorrhagic lesions. At autopsy, Denehy frequently found hemorrhagic areas in the brain and meninges. In one group of 800 men, among whom there had been 2 cases of meningitis, he found 179 carriers. These employees were not allowed to resume work until they had become free. A nose wash of sodium bicarbonate solution (1 dram to a pint) seemed to do good. A (1 to 1,000) permanganate solution did harm.

Autopsy Findings. Dickinson(7) found at autopsy on cases of epidemic meningitis that there was frequent plugging of the orifices of the ventricles and stoppage of the exit of fluid through the foramen magnum. In consequence, there was internal hydrocephalus. Drainage by lumbar puncture was ineffective and injection of serum failed to reach the cerebral meninges. He, therefore, recommends tapping of the lateral ventricles and injection of serum into the ventricles in extreme cases.

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(7) Brit. Med. Jour., April 7, 1917.

Dickinson also calls attention to what he terms serum reaction in cases of meningitis not due to meningococcus. He says that subsequent to the injection of serum in such cases the fluid becomes turbid as in epidemic cerebrospinal meningitis.

Carriers in Epidemic Meningitis. Gordon and Flack[8] think that the usually given proportion of carriers to cases among persons in contact with cerebrospinal meningitis of 16 to 1 is too high. In a very careful study they found that sixteen cases caused ninety-two carriers. Again, the ability of a carrier to infect depends upon the extent to which he is infected, his spraying capacity, the number of his friends and the degree of bad ventilation or overcrowding obtaining in his immediate environment. They say that persons harboring diplococci occasionally exhibit symptoms indicative of meningeal irritation and, further, that sometimes carriers develop definite attacks of cerebrospinal fever during isolation. Fortunately, most carriers become free in a short time. Only a few remain chronic carriers and potentially capable of spreading the disease over a long period of time.

The Medical Research Committee report that vaccines are of no use in clearing up the throats of carriers. Local treatment by heat and by zinc ions is also unsuccessful. So is the use of local disinfectants. Gordon and Flack found that bright sunshiny days are very potent in clearing up carriers. Where the infection is but slight they found that twice-daily snuffing of 1 per cent. solution of chloramine and expelling the solution through the mouth was effective. A permanganate gargle was used. On the other hand, where the nose is heavily infected this method is ineffective. The authors

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(8) Brit. Med. Jour., Nov. 18, 1916.

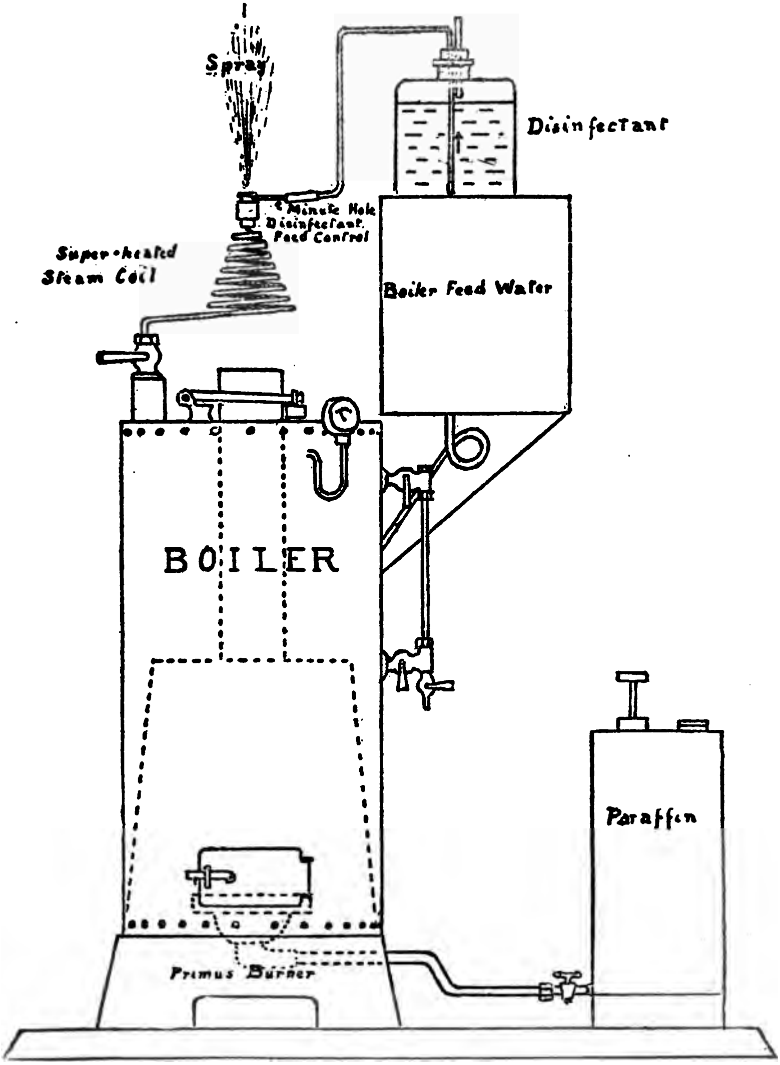

Fig. 14. Falmouth Portable Atomizer.

are of the opinion that the great difficulty in clearing up chronic carriers is in reaching all of the folds, crevices and sinuses in which the organisms are located. They, therefore, attempted to clear up chronic carriers by having them breathe an atmosphere heavily charged with disinfectant in fine sprays. They made use of a specially devised Falmouth spray with which they charged the air of the chambers with a 1.5 per cent. strength of chloramine. The room had a capacity of 750 cubic feet. One liter of the solution was sprayed into the room in from fifteen to twenty minutes. The patient remained in the room during that interval. One inhalation a day was given. The cases were cleared up in three to thirteen days; ten cases were cleared up, including some very persistent carriers; twenty-three were not cleared up.

Epidemic Meningitis in British Navy. Rolleston[9] During the year 1915-16 there were 104 cases of spinal meningitis in the British navy as compared with 170 during the first year of the war. In order to control the disease they examined the noses of 10,852 sailors. Of these 2.7 per cent. were found to be carriers. All recruits now have a bacteriologic examination of their nose secretions. They had a meningitis death-rate of 35.6 per cent. No cases were accepted as meningitis except those in which diplococci were found in the cerebrospinal fluid.

Halohoa[1] reports an epidemic of cerebrospinal meningitis in a naval training camp. There were nineteen cases and two deaths. The cases were treated as follows: Early puncture, free washing out of the cerebrospinal canal with 0.5 per cent. phenol in normal salt and injection of Pasteur serum from Gordon strains into the canal. Two of the patients were injected with Lister serum.

Meningitis in British Army. Parkes[2] says that the method of controlling epidemic meningitis now used in the army has resulted in complete control of the disease. The noses of all recruits are examined for diplococci.

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(9) Lancet, Jan. 13, 1917.
(1) Brit. Med. Jour., Dec. 30, 1916.
(2) Brit. Med. Jour., Feb. 24, 1917.

Only negative cases are allowed to proceed. The carriers found are treated by the Gordon-Flack method, using 1 per cent. zinc sulphate solution. Eight carriers are treated simultaneously in the treatment chamber. They lie prone for five minutes inhaling the vapor. They take inhalations daily for from five to ten days.

Methods of Government Control. An editorial in the *Lancet*[3] gives the methods employed in the British army and navy in recent months—the methods which have brought cerebrospinal meningitis completely under control.

There were 4,000 cases in round numbers in Great Britain during the previous twelve months. Of these about two-thirds were in civil and one-third in military life. All contacts and all recruits generally have a nasal bacterial examination. If the Gram-negative diplococci are found the individual is segregated until his nasopharynx has been made sterile. This is done by having him breathe an atmosphere saturated with a fine suspension of a mist of some antiseptic, usually 1.5 per cent. solution of chlororamine. A few inhalations generally suffice.

Contacts and Carriers. Armstrong[4] found that 3.6 per cent. of contacts with meningitis became carriers. He says that in military establishments there should be bacteriologic examination of all contacts.

Case Rates. The Public Health Reports[5] give the case rates from cerebrospinal meningitis in 1916 as follows: Hawaii, .065; Connecticut, .059; Massachusetts, .04; Rhode Island, .034; New York, .032; Maryland, .032; Kansas, .030; Ohio, .030; California, .022; West Virginia, .02; Minnesota, .02; Alabama, .019; D. C., .019; Pennsylvania, .019; Mississippi, .015; Oregon, .004; Colorado, .002; Maine, .001.

Among the states in which the number of deaths, but no case rates were given, were: Wisconsin, 389; Virginia, 297. The largest number of deaths in the entire list were: Montana, 60; Indiana, 52; Washington, 40; Louisiana, 39; South Carolina, 32. It seems that the

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(3) Feb. 10, 1917.
(4) Med. Jour. Austral., Dec. 9, 1916.
(5) June 15, 1917.

disease was most prevalent in those states in which the deaths but not the cases, were reported.

[During the winter of 1917-18 a great many soldiers and sailors will be in barracks in the United States. These barracks are built on the large unit plan. In many of them 140 and more men will be housed in a single room. These rooms are heated by steam and ventilated by windows. The number of cubic feet of air space is generally around 400, although in some instances it is less. The proportion of window space to floor space is large. The walls of the buildings are not thick enough to shield the occupants against cold. My observation indicates that the men will be chilled at times. The probability is that there will be extensive prevalence of colds, and in the wake of colds, pneumonia and meningitis. Measles and mumps will also be incident to the gathering of large groups of men from many sources into these large units. The outlook is that this war will be needed to teach us the importance of infections spread by nasal secretions as the war of 1898 was needed to teach us (and did teach us) the importance of infections spread by intestinal excretions. The best efforts of the army and navy epidemiologists will be required to make the soldiers and sailors safe against the infections due to housing the large units.—ED.]

INFANTILE PARALYSIS.

Control of Infantile Paralysis. A committee of the State and Provincial Boards of Health, consisting of Drs. Meader, Woodward, Watson, Chesley, Jepson, Leake and Roberg,[1] recommends the following rules as minimum requirements for the control of anterior poliomyelitis:

(*a*) The committee does not recommend the use of travel certificates, but travel and contact with children should be discouraged.

(*b*) Surveillance of persons coming from infected districts, in the opinion of the committee, is not necessary, unless the person has been definitely exposed to infection.

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(1) Pub. Health Rep., May 18, 1917.

(*c*) A most effective agency in the control of this disease is the employment of public health nurses who, in coöperation with the physician, will teach sick-room precautions, the necessity for rest in bed, and the need of proper support for affected parts.

(*d*) Expert diagnosticians should be provided and the use of lumbar puncture urged.

(*e*) Food, especially such as is consumed uncooked, should be considered as a possible means of transferring the infectious agent, and appropriate measures should be instituted to protect the public during an outbreak.

(*f*) Where poliomyelitis occurs in a school, the committee advises that the school be not closed, but that daily medical supervision be instituted.

(*g*) Efficient screening and the use of approved insecticides should be employed so that insects shall not have excess to the patient or his excretions.

(*h*) Household pets should be excluded from the sick room.

(*i*) In the presence of poliomyelitis a search for, and a careful examination of all ill children should be made. All children having fever should be isolated pending the diagnosis.

(*j*) Prompt reporting of all recognized or suspected cases, personally, by telegraph, or by telephone, is essential, in addition to the written report required by law.

(*k*) Weekly reports by state and territorial health authorities should be made to the United States Public Health Service.

Emerson,[2] the health commissioner of New York City, gives his opinions as to the public health control of infantile paralysis. In 1916 there were 24,000 cases of this disease in the United States. Of these nearly one-half were in New York City. The epidemic began in the latter part of May. On June 8, a report came in that there were several babies with paralyzed arms in a Brooklyn dispensary, the district in which the epidemic started. On June 22, three cases of the disease were reported. Emerson became suspicious and went

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(2) Bull. Johns Hopkins Hosp., April, 1917.

to the press with the statement that infantile paralysis was epidemic. Efforts to find the disease were begun. It was found in this investigation that there were twenty-three cases of unreported infantile paralysis on June 22. After that date probably few cases escaped unreported. Emerson says that when people begin to report cases on suspicion then you begin to be at the point of controlling the situation.

On August 3, 239 cases had their onsets and these cases reached the hospitals forty-eight hours after the onset of the disease, which is about as close as a department can get to having a case verified and under proper control after onset. The New York City Health Department accepted about 40 per cent. of the cases reported as under suspicion as cases of infantile paralysis; 15 per cent. of the cases accepted as poliomyelitis had no paralysis any time; 18 per cent. more had no paralysis when they left the hospital; 89 per cent. of the deaths were due to failure of respiration.

In some instances, evidence of contagion seemed overwhelming. In more cases such evidence was wholly lacking. In one instance one case developed in a children's home and foundling's asylum. Not another case came from it. How different this is from what would have happened had a single case of measles gotten into the same asylum!

The distribution of cases was wholly independent of sanitary conditions. On Barren Island there are 350 children. New York's garbage and dead animals are reduced on this island. The place reeks with filth, smells and flies. There are no sanitary provisions such as sewers, garbage collection, public water supply. No cases developed on this island.

The most constant initial symptom was acute onset of fever. The next was irritability. The poliomyelitis child does not want to be picked up and fondled by the mother. Evidently anterior flexion of the spine was painful.

Spinal puncture gave a spinal fluid that was not turbid. The non-turbid fluid had a high cell count and an increase of globulin. A fluid of this character with a history of acute onset of fever, irritability and the spinal sign on flexion is enough for a diagnosis.

To prevent the disease they hospitalized all the cases and segregated all the contacts as well as they could. Children were especially warned against eating raw fruit. No evidence was found that milk spread the disease. The quarantine period was eight weeks.

The case rate in the different New York boroughs was lowest in Manhattan (.94), where the density of population is highest, and highest in Queens (3.22) and Richmond (2.99), where the density of population is lowest.

The therapeutic procedure which gave greatest relief was spinal puncture. It was found to be inadvisable to give massage or exercises until eight weeks after the onset of the illness.

Emerson pronounces the following report of a committee of the American Public Health Association the best that he has seen.

The committee of the American Public Health Association, appointed by the President to report upon the subject of poliomyelitis, begs to submit the following:

"The specific cause of poliomyelitis is a microörganism, a so-called *virus*, which may be positively identified at present only by its production of poliomyelitis in monkeys experimentally inoculated. Such experiments have shown this virus to be present not only in the nervous tissues and certain other organs of persons who have died of poliomyelitis, but also in the nose, mouth and bowel discharges of patients suffering from the disease. It has been proved by similar experiments that healthy associates of poliomyelitis cases may harbor the virus in their noses and throats.

"These experiments, together with the fact that monkeys have been infected by direct application of the virus to the mucous membrane of the nose and by feeding of the virus, are strong evidence that in nature infection may be directly spread from person to person.

"Observations on the occurrence of the disease might seem at first thought to be inconsistent with this conception, since contact between recognized cases can seldom be traced. However, this may be adequately explained by the lack of means for detecting mild non-paralytic cases, and by the belief that healthy carriers of the virus and undetected cases are considerably more numerous than frankly paralyzed cases.

"Many facts, such as the seasonal incidence and rural prevalence of the disease, have seemed to indicate that some insect or animal host, as yet unrecognized, may be a necessary factor in the spread of poliomyelitis, but specific evidence to this effect is lacking, and the weight of present opinion inclines to the view that poliomyelitis is exclusively a human disease and is spread by personal contact, whatever other causes may be found to contribute to its spread. In personal contact we mean to include all the usual opportunities, direct or indirect, immediate or intermediate, for the transference of body discharges from person to person, having in mind as possibility that the infection may occur through contaminated food.

"The incubation period has not been definitely established in human beings. The information at hand indicates that it is less than two weeks, and probably in the great majority of cases, between three and eight days.

"If the foregoing conception of the disease is correct, it is obvious that effective preventive measures approaching complete control are impracticable, because isolation of recognized cases of the disease and restraint upon their immediate associates must fail to prevent the spread of infection by unrecognized cases of carriers.

"These difficulties would appear to be inherent in the nature of the disease. Nevertheless, we may hope for the development of more thorough knowledge which will permit of more effective control of the disease than is now practicable. Of first importance is the more general recognition by practitioners of non-paralytic cases through clinical observation and laboratory procedures.

"Lumbar puncture has been shown to offer valuable aid in diagnosis, and a more general use of this test is to be encouraged, since it not only facilitates accurate and early diagnosis, but in many cases affords symptomatic relief as a therapeutic procedure. Without undertaking to predict the future progress of research, we may hope for certain possible developments which may afford far more effective control of the disease, with substantial relief from many inconveniences at present inevitable. Among those possibilities we would include: A practical test for the detection of all clinical types and carriers; a simple and reliable test for distinguishing between susceptible and insusceptible persons; and means of conferring artificial immunity against poliomyelitis.

"At present our information demands the employment of the following administrative procedures in attempting to control the disease:

"1. The requirement that all recognized and suspected cases be promptly reported.

"2. Isolation of patients in screened premises. The duration of infectivity being unknown, the period of isolation must necessarily be arbitrary. Six weeks has been recommended by the Conference of State and Territorial Health Officers with the Surgeon-General of the Public Health Service as sufficient, and this period has been generally accepted throughout the United States.

"3. Disinfection of all body discharges.

"4. Restriction of the movements of intimate associates of the patient so far as practicable. This should include at least exclusion of the children of the family from schools and other gatherings.

"5. Protection of children so far as possible from contact with other children or with the general public during epidemics.

"6. Observations of contacts for two weeks after the last exposure.

"There is no specific treatment of established value in poliomyelitis. During the persistence of the acute symptoms of the disease, the important principles of treatment are rest in bed, symptomatic relief, and passive support for the prevention of deformities. Active measures during this stage are not only useless but are apt to cause serious and often permanent injury. Hospitalization of patients where possible is to be encouraged. The best chances of recovery from residual paralysis demanded skillful after-care, often long continued, and always under the direction of a physician familiar with the neurological and orthopedic principles of treatment.

The provision of such after-care often becomes a community problem, demanding the coöperation of all available agencies, social and professional."

In the discussion Emerson said that he found that opening the schools did not increase the disease. There was actually a falling off, though the lateness of the season may have been a factor.

Infantile Paralysis in New York State. In the summer of 1916, Clark[3] saw 264 cases of infantile paralysis in Ulster and Sullivan Counties, New York. He is of the opinion that a diagnosis can be made without difficulty in the absence of all paralysis if the examiner is experienced. The symptoms are to be considered. Clinical examination must be thorough and the spinal fluid is to be drawn, examined and analyzed.

In a previous epidemic experience Clark found diarrhea and catarrh of the nose and throat to be frequent symptoms. In this epidemic 85 per cent. of the cases had constipation; 90 per cent. had marked rigidity of the neck; drowsiness was present in 65 per cent., nausea in 80 per cent. Vomiting was not projectile. The temperature ranged between 100 and 105° F. Delirium was rarely present. Sore throats were very infrequent. A striking symptom was a peculiar tongue. The tongue looked as though it had been carefully spread over with office paste—like butter spread on bread. The severity of onset was no criterion on which paralysis, its development, its distribution or its severity could be predicated. The spinal fluid when unmixed with blood was always clear. Fehling reaction for sugar was always given. Globulin was always present. The increase in lymphocytes ranged from 15 per cent. upward.

Epidemiology. T. G. Hull[4] studied the epidemiology of the 1916 epidemic of poliomyelitis in and around New York City arriving at the following conclusions:

The disease followed the main lines of travel and especially of railroad travel. This indicates that the disease is carried by human beings. There are occasional cases in very isolated communities where the element of contact is difficult of proof. This seems to upset the

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(3) Buffalo Med. Jour., December, 1916.
(4) Amer. Jour. Pub. Health, October, 1917.

theory of contact but when the cases are plotted the fact that spreading is along routes of human travel is overwhelming.

The disease spreads in waves over the country. It starts in hot weather and attains its maximum in about six weeks in most instances. It seems then to subside in that locality because it has burned out all the susceptible material. In the meanwhile it flares up in some other locality. If cold weather comes before the disease reaches its maximum the outbreak is promptly terminated. This prevalence in hot weather has suggested to Winslow and also to Hull that the disease is spread either by insects or by intestinal secretions. Diseases which spread by nose secretions are always worse in the cold months. In the southern hemisphere, infantile paralysis is a disease of December, January, February, March and April. The disease develops during dry seasons as noted by Hill in 1906. In eighteen epidemics in various parts of the world—in which there were 13,365 cases of the disease—90 per cent. of the cases occurred in months in which the rainfall was below normal. The dryer the weather the larger the number of cases. Out of thirty-four epidemics occurring during the last seventy-five years, 76 per cent. began in the months of deficient rainfall and in 29 per cent. of them the drought lasted throughout the epidemic.

Diagnosis and Treatment. Snow[4] thinks physicians should post up on the newer developments in the diagnosis and treatment of infantile paralysis in view of the responsibility of the family physician to recognize the disease early and to bring it to the attention of authorities. He relates two instances in which physicians had several cases in their own families due probably to their own neglect. He thinks the habitual use of a saline nose wash advisable in the face of an epidemic.

Bacteriology. L. Hektoen[5] thinks the cocci described by Mathers[6], Nuzum and Herzog,[7] and Nuzum,[8] and

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(4) Buffalo Med. Jour., December, 1916.
(5) Boston Med. and Surg. Jour., May 17, 1917.
(6) Jour. Amer. Med. Ass'n., Vol. 67, p. 1019; Jour. Infect. Dis., 1917, Vol. 20, p. 113.
(7) Jour. Amer. Med. Ass'n., 1916, Vol. 67, p. 1205.
(8) Ibid, p. 1935.

that described by Rosenow, Towne and Wheeler[9] are the same organism.

The coccus grows large or small dependent upon the media on which it is grown. It is filterable through ordinary laboratory filters. It is resistant to glycerol. It grows anaërobically and aërobically. It is found in the lesions of animals with the disease and in the tonsils and throats. Cultures even after several generations are capable of producing the disease in susceptible animals.

Hektoen concludes that there is not yet evidence enough on which to base a conclusion as to whether this organism is responsible for infantile paralysis or not. Whether it produces the diseases directly or merely transmits the agent incorporated within itself or is in any way the cause can not be stated.

Rosenow[1] says: "I think we have been able to prove that there is present in the throat, in the tonsils and in abscesses in tonsils, and also in the central nervous system of patients with poliomyelitis, a form of streptococcus that looks quite ordinary but that has a peculiar infecting power in that it will end to localize in the central nervous system of animals. It looks to us as if we have in poliomyelitis to deal with a streptococcus infection. This coccus grows large or small according to the medium and environment. We grew the large form of organism from the central nervous system in 100 per cent. of cases."

Kolmer, Brown and Freese[2] do not accept the organisms described by Mathers, Rosenow, Towne and Wheeler and Nuzum and Herzog as of consequence in anterior poliomyelitis. They were not able to produce the disease by injecting cultures of these cocci. They say that such organisms are frequently present in the tissues in poliomyelitis. They grow as described but they are not the cause of the disease.

Mathers[3] reports the finding of the polymorphic streptococcus-like organism in nine out of ten cases of acute infantile paralysis.

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(9) Ibid, 1917, Vol. 68, p. 280.
(1) Long Island Med. Jour., March, 1917.
(2) Jour. Exp. Med., June, 1917.
(3) Jour. Infect. Dis., January, 1917.

Protective Function of Meningeal-Chorioid Plexus. Flexner and Amoss[4] say that the meningeal-chorioid plexus complex is normally capable of excluding the circulating virus from the central nervous system. It plays a part also in preventing infection from virus present on the nasal mucosa. Aseptic fluids which irritate, inflame or even slightly alter the integrity of the meninges and chorioid flexus diminish or remove this protective function. Isotonic salt solution injected into the meninges promotes infection. Simple lumbar puncture without hemorrhage does not. With hemorrhage it does.

They say that the virus of poliomyelitis contained within the spinal cord has been kept in 50 per cent. glycerol at refrigerator temperatures for from four to six years.

Inactivation of the Virus. Amoss and Taylor[5] found that washing the nasal and pharyngeal mucosa possessed definite power to inactivate or neutralize the active virus of polio in fifty-six experiments. Inflammatory conditions of the mucosa diminished this power. The neutralizing substance is water soluble not inorganic and more or less thermolabile. It is not due to mucin. It is probably not the sole protecting agency.

Spread of Infantile Paralysis. Noguchi and Kudo[6] found no evidence that mosquitoes and flies are capable of spreading infantile paralysis. *Culex pipiens* failed to transmit the disease. No trace of the virus was demonstrable in the filtrate of an emulsion of adult flies and pupae of the common house-fly and blue-bottle fly reared on brain tissue from monkeys dead of poliomyelitis.

Poliomyelitis in American Cities. Public Health Reports[7] state that the twelve cities with the heaviest infantile paralysis rates in 1916 were: Newark, 3.478; New York, 1.610; Trenton, 1.497; Syracuse, 1.470; Boston, .861; Springfield, Mass., .831; Paterson, N. J., .708; New Haven, .635; Jersey City, .630; Camden, N. J., .621; Bridgeport, Conn., .600; Philadelphia, .588.

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(4) Jour. Exp. Med., April, 1917.
(5) Ibid.
(6) Ibid, July, 1917.
(7) April 20, 1917.

PLAGUE.

Tenth Report on Plague of the British Advisory Committee.[8] This report proves that temperature and atmospheric humidity are of major importance in the epidemiology of plague. The optimum for the spread of an epidemic of plague is a mean temperature below 80 and an atmospheric relative humidity approaching saturation. Whenever the temperature was above 80 and the deficiency of atmospheric moisture was in excess of 0.3 of an inch the disease died out. Whenever the air is very dry epidemics of plague die out even though the mean atmospheric temperature is below 80. They increase if the humidity is high, even though the temperature is above 80. A proper humidity, therefore, is the factor of greatest importance. A proper temperature ranks second in importance.

The influence of atmospheric temperature and humidity is exerted on the rat flea separated from the rat. Whenever the air is right this flea carrying plague bacilli is apt to live long enough after leaving its rat host to reach, bite and infect a human being. When the air conditions are wrong either the flea does not quit its rat host or it speedily dies when separated from him.

Epidemiologists have long known that there were telluric factors affecting the spread of epidemics but comparatively little work on the subject capable of serving as the basis for scientific opinion has been done.

[Crum in an article on diphtheria appearing in the *American Journal of Public Health* expresses the opinion that we must study the telluric factors in epidemic diphtheria before we can hope to suppress the disease.—ED.]

Septicemic Plague. Phillip and Hirst[9] describe an epidemic of septicemic plague which prevailed at Colombo, Ceylon. The disease in the human subject was characterized by high fever and sudden death. Rarely did either buboes or pneumonia develop. The death-rate among rats was not high. The dead rats did not show bubo. It was only by bacteriologic examination of the

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(8) Jour. Hyg., May, 1917.
(9) Ibid., February, 1917.

blood of men and rats that the disease was diagnosed. The outstanding contribution of the authors is the statement that an epidemic of this type of plague might exist for some time without being recognized. None of the signs—buboes, pneumonia among people and high death-rate among rats being present to suggest bubonic plague. The methods of control employed embraced hospitalization of cases, segregation of contacts, inspection, disinfection of buildings with crude petroleum or a mixture of petroleum and cyllin, removal of the roofs of buildings to let the sun in, sulphur fumigation of rat runs with the Clayton machine, search for rat nests and dead rats, capture and poisoning of rats, rat-proofing, estimation of flea index. An attempt to use plague vaccine was ineffective because of the opposition of the natives.

ANTHRAX.

Epidemic of Anthrax. Brown and Simpson[1] report an epidemic of twenty-five cases of anthrax occurring in four months in Massachusetts. The cases occurred in men who worked in three tanneries located in adjoining towns. A peculiar trade marked stamp made it possible to trace all the cases to one shipment of hides coming originally from Hankau, China. Anthrax is known to be endemic in that part of China. The usual regulation demands that the hides bear a certificate that they come from a district in which there is no anthrax or that the hides shall be immersed for thirty minutes in 1 to 1,000 bichloride solution. Neither requirement is satisfactory. Information as to where there is and where there is not anthrax is inexact and unsteady. Treatment for thirty minutes with 1 to 1,000 bichloride will not kill anthrax spores in hides.

RABIES.

Preparation of Antirabic Virus. Harris[2] says that a technical difficulty in the original antirabies treatment of Pasteur exists in the necessity of infecting a rabbit

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(1) Jour. Amer. Med. Ass'n., Feb. 24, 1917.
(2) Jour. Amer. Med. Ass'n., Sept. 23,. 1916.

every day in order to have rabbit spinal cords of different ages and different degrees of desiccation on hand continuously. This is practically impossible except in extensively equipped and specialized laboratories. The author, together with Shackell, presents a modification of Pasteur's method whereby the brain as well as the cord of infected rabbits is used for injections and the material is preserved for several months. It is desiccated in a partial vacuum with concentrated sulphuric acid after freezing with carbon dioxide snow and held at a temperature of —18° C. for from thirty-six to forty-eight hours. The desiccated product is kept at a temperature of 0° C. Experimental work on rabbits show that this product has an immunizing value equal to that of Pasteur's desiccated cord and immunity can be produced earlier. In the treatment of 1,159 cases only two failures occurred and in these symptoms developed before complete immunization could be accomplished. By this method patients and physicians are saved time.

TRACHOMA.

Prevalence of Trachoma. McMullen[3] found that about 7 per cent. of about 18,000 persons in twenty-three counties in Eastern Kentucky had trachoma. It does not follow that 7 per cent. of the population in that state had trachoma but the disease is beyond question widely prevalent in the Appalachian mountain region.

The Public Health Service is combating the disease through six hospitals and their full quota of physicians and nurses. In five of these hospitals 1,880 patients were operated on in twelve months. The hospitals not only treat and cure the patients who come to them, but they teach the patients how to prevent the spread of the infection. In addition the physicians and nurses connected with the hospitals hold clinics away from the institutions and visit the patients in their homes. The essential principle of the service from the sociologic standpoint is first to give curative care and then to make use of the standing gained to teach hygiene and sanitation.

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(3) Southern Med. Jour., February, 1917.

The treatment consists in grattage of the granulations on the lids. The eyelid is fully everted, the field is scarified and the granules are incised superficially. The surface is gone over with a brush and 1 to 2,000 bichloride solution. Next the granulations are rubbed off with gauze until the surface is smooth. Then the conjunctiva is washed with boric-acid solution. This operation can be done under local anesthetics except with children. After-treatment consists in cleansing the eyes every three hours with a 20 per cent. argyrol solution. The eyes should be under the surveillance of a surgeon for from twenty-four to forty-eight hours. After from five to six days the eyes should be examined and if rough surfaces are present they should be lightly brushed with a 1 to 2 per cent. silver nitrate solution. This is to be repeated as often as necessary.

In old cases with panus an operation on the lids for partial eversion is done. Where glasses are needed they are fitted.

Early cases of trachoma are cured without trouble. McMullen thinks that 50 per cent. of his series, many of which were late cases, have been cured. Hundreds of persons wholly incapacitated for work have been made capable of earning a living. Knowledge of trachoma, methods of preventing it and possibilities of curing it have been spread broadcast among a people greatly in need of the information.

ANKYLOSTOMIASIS.

Hookworm in China. Chow[4] found hookworm very prevalent in Hsi Kwang Shan, China. This is a farming and antimony mining district. The sanitary standards are very low. Excrement is deposited on the surface of the ground and washed by the rains into the water supplies. The fields are fertilized with human excrement.

The percentages of persons infected with hookworm in several groups were as follows: Miners, 6.35; other coolies, 6.98; farmers, 70.59; merchants, 25; miscellaneous, 6.25. Totals, 12.86.

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(4) New Orleans Med. and Surg. Jour., April, 1917.

The percentage of infestation with ascaris was: Miners, 100; other coolies, 100; farmers, 100; merchants, 91.66; miscellaneous, 93.75. Total, 98.57.

Tricocephalus: Miners, 7.94; other coolies, 13.95; farmers, 23.53; miscellaneous, 3.13. Totals, 10.48.

It was Chow's opinion that the miners became infected when they were farmers. Mining has only recently been developed but unless precautions were taken the miners would become infected in the same proportion as farmers.

CHOLERA.

Vaccination Against Cholera. Verdelet[5] gives his experience in vaccinating French troops, sent to Salonika, against cholera. He injected 1 c.c. of cholera vaccine into the subcutaneous tissue of the scapular region. Eight days later he gave the second and last dose, 2 c.c. He observed the following phenomena:

1. Some had syncope similar to that sometimes found after smallpox vaccination.
2. Pain in the area of injection. This pain came on three or four hours after vaccination and lasted twenty-four hours. This pain is less than that after typhoid vaccination. It is greater after the second than after the first dose.
3. The constitutional phenomena are of minor importance. A few soldiers had a little malaise, fatigue, insomnia. None had fever.
4. A great many of the vaccinated soldiers had a disagreeable manifestation of cold extremities coming on a few hours after the injection.
5. Some had a temporary diarrhea. This was self-limited and required no medication.
6. Some soldiers had a temporary pollakuria. There are no contraindications. The reaction is much less than after typhoid vaccination. Immunity lasts six months.

INFLUENZA.

Cause of Epidemic. Mathers[6] reports that the epidemic of so-called influenza in 1915-16 was not caused

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(5) Jour. de méd. de Bordeaux, June, 1916.
(6) Jour. Infect. Dis., July, 1917.

by the influenza bacillus. This bacillus was found in less than 0.5 per cent. of the throat cultures examined. The prevailing organism was streptococcus viridans, though pneumococci were frequently found.

VENEREAL DISEASES.

Control of Venereal Diseases. The growth of the fight against venereal diseases in England, Scotland, Ireland and Wales is very interesting. The *British Medical Journal*[7] contained accounts of the organization of the work against venereal disease in each of these countries. In Aberdeen, Scotland, a venereal disease center is provided by the Royal Infirmary of Aberdeen. There is provision of twelve hospital beds and two day and two evening clinics for ambulatory cases. Provision is made for laboratory diagnosis of all cases. A physician is paid $1.25 (5 shillings) for taking and sending in blood for a Wassermann test and 62 cents (2.6d) for taking and sending in smears. MacKenna of Liverpool reported that in his city they had found no special need for evening clinics. "It was not found that the evening hour specially attracted venereal cases."

Venereal Disease in the British Army. W. Osler[8] says that the British army at home had had, up to April 23, 1917, 71,000 cases of gonorrhea, 21,000 cases of syphilis and 6,000 cases of soft chancre. In the Canadian army up to March 31, 1917, there had been 18,335 cases of venereal disease. In England by legislative enactment, venereal disease clinics are being founded. The hospitals are taking cases of venereal disease. Osler advocates notification in spite of the report of the Royal Commission against it. He also advocates compulsory treatment.

The Campaign Against Venereal Disease in Great Britain. On July 12, 1916, the Liverpool Medical Institution launched a campaign against venereal diseases. Newsholme[9] said that in 1888, 42 per cent. of the total sickness among soldiers was due to venereal disease. In 1912 the rate was 28 per cent. of the total.

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(7) Feb. 3, 1917.
(8) Lancet, May 26, 1917.
(9) Liverpool Medico-Chirug. Jour., 1916.

[The report from the American soldiers on the Mexican border in 1916 was that venereal disease was responsible for 16 per cent. of the disease disability.—Ed.]

Now the civil governments of Great Britain are required to establish diagnosis and treatment centers partly as a measure of protection of the army against venereal disease among civilians, and partly as a measure of protection of civilians against venereal disease in the army. The expense of the conduct of such diagnostic laboratories and treatment stations is to be divided between the federal and local governments in the proportion of three dollars from the former for each one dollar from the latter. The division of expense in the case of tuberculosis and infant welfare is 50-50. The government shoulders a larger part of the cost of venereal disease work because persons with those diseases are more liable to travel from town to town. Every person who needs treatment must be able to get it even though he be not in his home town. In the main, treatment should be given in general dispensaries. These dispensaries should be open evenings. There should be as little exposure and publicity as is possible. The few cases that need hospital care should be cared for in general hospitals.

Mott[1] says that general paresis is responsible for 15 per cent. of the admissions to insane hospitals of males and 2 to 3 per cent. of females. It costs England $450,000 a year to care for its paretics. The cost of caring for locomotor ataxia is even greater. If there were no syphilis there would be no general paresis and if there were no syphilis there would be no locomotor ataxia.

The motion to undertake the work in Liverpool was made by Barlow,[2] who emphasized the harm done by gonococcus infections, in addition to those due to syphilis, which last were covered by other speakers.

Mrs. Gotto[3] said: "Ignorance has been the difficulty we have been facing with regard to these venereal diseases from the beginning. Firstly, ignorance as to their nature. That has now been removed. Secondly, igno-

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(1) Liverpool Medico-Chirug. Jour., 1916.
(2) Ibid.
(3) Ibid.

rance as to the best methods of treatment. That, too, has been removed. There remains the ignorance of the general public as to the knowledge which exists to help them. It is up to us to remove that."

Venereal Disease in the United States Army. Exner[4] says that one of the great powers engaged in the great European war had more men incapacitated for service during the first eighteen months from venereal disease than in all the fighting at the front. Not only is this important from the standpoint of wastage of military strength and efficiency, but it is also important because it means that these men will bring back into the social structure a vast volume of venereal disease to wreck the lives of innocent women and children.

Judging by his observations on the Mexican border last summer, Exner does not think this wastage is necessary. Based upon these observations he is of the opinion that both prostitution and the use of alcoholic beverages can be repressed in military camps and for an effective zone around them. In Camps I and H, where the commanding officers made strenuous efforts to repress prostitution, the monthly rate per cent. of men using the prophylactic procedures were 0.566 and 3.78, compared with rates of 16.56 and 20.4 in two camps where the commanding officers encouraged the presence of prostitutes in close proximity to the camps.

The number of new cases of venereal disease in each of these two camps was 3, as compared with 28 and 19 in the two worst camps.

A study of the record for venereal diseases of a regiment of regulars, the record extending over two and a half years, convinces Exner that "venereal prophylaxis as now carried out in the army proves effective in large measure. It is significant that the two camps in which prostitution was most inaccessible have by far the lowest venereal rate."

The position of the United States military authorities on venereal diseases and on the use of alcoholic beverages by soldiers and sailor is fairly set forth in the following resolutions passed by the Council of National Defense:

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(4) Social Hyg., April, 1917.

WHEREAS, venereal infections are among the most serious and disabling diseases to which the soldier and sailor are liable;

WHEREAS, they constitute a grave menace to the civil population;

THEREFORE, the Committee on Hygiene and Sanitation of the General Medical Board of the Council of National Defense, recommends that the General Medical Board transmit to the Council of National Defense for the guidance of the War and Navy departments the following recommendations:—

1. That the departments of War and Navy officially recognize that sexual continence is compatible with health and that it is the best prevention of venereal infections.
2. That the departments of War and Navy take steps toward the prevention of venereal infections through the exclusion of prostitutes within an effective zone surrounding all places under their control, and by the provision of suitable recreational facilities, the control of the use of alcoholic drinks, and other effective measures.
3. That the said departments adopt a plan for centralized control of venereal infections through special divisions of their medical services.
4. That the said departments consider the plan of organization herewith attached.

WHEREAS, the use of alcoholic beverages is generally recognized as an important factor in the spread of disease in the Army and Navy; and

WHEREAS, these diseases are among the most serious and disabling ones to which soldiers and sailors are liable;

THEREFORE, be it resolved that we endorse the action of the Army and Navy, in prohibiting alcoholic beverages within military places in their control and we further recommend that the sale or use of alcoholic beverages be prohibited to soldiers and sailors within an effective zone about such places.

Program of Attack on Venereal Diseases in U. S. Army. Surgeon-General Gorgas, acting through a committee of which Dr. F. F. Russell[4] is chairman, has prepared a manual of venereal diseases from which the following program is taken:

The methods divided themselves into four classes:

A. Social measures to diminish sexual temptations.

B. Education of soldiers and civilians in regard to venereal diseases.

C. Prophylactic measures against venereal diseases.

D. Medical care.

The program of prophylactic measures embraces: (1)

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(4) Jour. Amer. Med. Ass'n., Oct. 20, 1917.

instruction, (2) regimental infirmaries, (3) infirmaries in civil centers.

In cities where there are no adequate civil dispensaries to be used and through which soldiers in considerable number pass either while on leave or in travel there should be provided in accessible locations regimental infirmaries. In a few cities where dispensary services are particularly well-developed regimental infirmaries may be replaced to advantage by accrediting these civil dispensaries for use.

Long leaves of absence of soldiers should be discouraged.

Prostitution should be suppressed.

Under the head of medical care suggestions are made as to venereal disease hospitals, dispensaries and laboratories.

As a part of the program for the protection of the army the civilian authorities should provide venereal disease dispensaries and laboratories and beds for the care of the venereally infected in hospitals.

Venereal Disease in Toronto. Bates[5] reports the result of an investigation of where and how a certain group of men became infected with venereal disease. Eighty-nine were infected through illicit sexual relations; eleven were apparently infected by their wives. In nine cases infection took place in houses of prostitution; in thirty-one, the men went to the boarding houses of the women; in twelve, they had registered at hotels as man and wife; in twenty, they had gone to strange rooming houses. Forty-one of the women had gainful occupation in addition to prostitution; nine were definitely prostitutes. Dr. Detweiler found that 12 per cent. of the persons entering the public wards in the first three months of 1917 gave a positive Wassermann reaction. Gonorrhea is six times as prevalent as syphilis. In a command of 10,000 men, 1,500 venereal cases developed.

Venereal Disease Control in New York City. Chargin[6] relates the activities of the New York City Health Department in controlling venereal diseases. The cases

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(5) Pub. Health Jour., August, 1917.
(6) Ibid.

reported in 1916 were as follows: Syphilis, total number reported, 20,129; reported through laboratory, 15,166 or 75.3 per cent.; by institutions, 4,924 or 24.4 per cent.; by private physicians, 39 or .3 per cent. Gonorrhea, total, 6,341; through laboratory, 2,600 or 41 per cent.; by institutions, 3,640 or 57.4 per cent.; by private physicians, 101 or 1.6 per cent. Four diagnosis laboratories are maintained. There are clinics for diagnosis and advice but not for treatment. The department furnishes a list of accredited dispensaries. To be accredited a clinic must conform to certain standards. In 1916, 5,868 persons visited these advisory clinics. The relation of the different diseases were, sex and other neuroses, 1; diseases other than venereal, 2.5; syphilis, 3; gonorrhea, 4. Eighty per cent. of the infections were contracted from prostitutes.

The public are educated by lectures and through a sex disease museum. A campaign against men's specialists and venereal disease specialists is waged. The department is in favor of supplying free salvarsan or its equal. They advocate the use of a proper prophylactic packet though they do not regard any now on the market as satisfactory.

[One effect of this war on civil life will be the incorporation of venereal diseases in the list of communicable diseases by municipal and state health departments and the adoption and execution of appropriate measures for their control. The taboo on syphilis and gonorrhea in newspapers, books and serious conversation will be removed.—ED.]

Microscopic Diagnosis of Venereal Diseases. F. W. Mott[7] in discussing the pathology of venereal diseases advocates microscopic examination as the only satisfactory method for the diagnosis of venereal disease. When syphilis is diagnosed by finding spirochetes before a positive Wassermann is obtained, cure can be promptly effected with a small amount of treatment. Where treatment waits on secondaries or on a positive Wassermann test much more medicine and a longer continuance of it is necessary. When treatment of gonorrhea is based

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(7) Jour. State Med., September, 1917.

on a microscopic examination made at the very onset of the disease treatment may be successful in a short time. He quotes Levaditi as saying that the syphilis organism can be demonstrated at the point of inoculation prior to the appearance of any lesion proving that syphilis may be infectious during a part of the incubation period.

The lesser prevalence of bone and skin lesion in syphilis in recent years he ascribes to lessened influence of secondary infections with pus cocci. Children who are born infected with syphilis may have the disease remain latent until puberty when they break down with general paresis, usually called dementia precox. Under these circumstances: "One often finds a child has done well at school and even reached the sixth or seventh standard when the mind begins to show signs of decay and gradually all signs of the disease appear."

Syphilis. Thompson[8] discusses the prevalence of syphilis, giving percentage statistics as to its incidence, in several cities. He notes its effect on the public health and the economic loss to society and advocates its control and extermination by:

1. Education—teaching the youth of the country the dangers of the disease.
2. Personal prophylaxis systematically employed—the use of from 30 to 50 per cent. calomel ointment after intercourse.
3. Control and medical examination of prostitutes.
4. Suggestion of segregation of syphilitics but admitting its impossibility.
5. *Most important,* he believes the solution lies in making syphilis a reportable disease, and regulating its treatment by law, prohibiting marriage of syphilitics and making persons with syphilis in the active stage impose self-isolation until the contagious stage is past.

Alcohol and Syphilis in Relation to Insanity. Williams[9] says that the time has come to stop pussyfooting about syphilis; that we must stop mollycoddling syphilis and place it where it belongs, in the class with such diseases as smallpox and leprosy, and treat it accordingly. We should cease laying stress upon the venereal

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(8) Southern Med. Jour., Oct. 1, 1916.
(9) Amer. Jour. Pub. Health, December, 1916.

nature of syphilis and emphasize the fact that it is a contagious disease. Syphilis is responsible for 10 per cent. of the insanity. It is generally agreed that alcohol is responsible for about 20 per cent. The percentages given by different men differ somewhat, according to the care taken to separate the cases into those of which alcohol is the fundamental cause and those in which it is a secondary and contributing factor. For instance, a considerable part of the alcoholics are primarily neurotics or even insane, but they would have remained producing members of society had they not become alcoholics. Alcohol is responsible for the hallucinosis without which they would have been able to take care of themselves. Since it was alcohol which made this group into state wards there is justice in charging the expense of their care against alcohol.

Gonococcus Vulvovaginitis. Gittings and Mitchell[10] abstract all of the literature on gonococcus vulvovaginitis in childhood for the past five years. In 1912 Generisch abstracted all the literature prior to that time in the Budapest *Medical and Surgical Press.* All the literature is therefore readily available. Gittings and Mitchell report that Barnett's questionnaire showed that sixty-nine cases were due to contact with adult members of the family (not immoral); fifty-three to toilet seats or toilet articles; twenty-eight to nurses or attendants; eight to direct transmission, and fourteen to other causes combined. He says that visiting nurses and social workers reported as follows: Other members of the family, 102; hospital wards, 107; playmates, 31; sleeping arrangements, 14; toilet and bathing facilities, 10; rape, 8; all other sources, 136.

OCCUPATIONAL DISEASES.

Attempts to Establish the Hours of Labor for Different Tasks which Will Produce the Greatest Output.[1] If the hours are longer than those set forth the output will be less because of fatigue and consequent slowing down. The committee states that the only purpose was to determine the question of the number of hours required for the maximum output and that it recognized the fact that such hours, if continued long, would necessitate the scrapping of many workers. Furthermore, the hours set would not be justified nor would they produce the maximum of production except in war times.

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[10] Amer. Jour. Dis. Chil., May, 1917.

[1] Report British Health of Munition Workers Committee; Bur. Labor Stat., Indust. Acc. and Hyg., Series No. 15.

The committee is definitely opposed, as the presently quoted statements will show, to the same hours of labor for all tasks. Furthermore, careful allotment of short rest periods, longer holidays and less night work, good lighting, good ventilation and good surroundings increase the number of hours during which there can be maximum production very materially.

In Memorandum No. 5, the committee recommended that the average weekly hours of labor should not exceed from 65 to 67 hours for men and 60 hours for women, including overtime, but advised that these standards be modified for different jobs as the result of careful studies. This study is in accordance with that suggestion.

For men engaged in the very heavy labor of sizing fuse bodies, the maximum hours of work should be 56 a week; for men in boring the powder chamber and in turning and finishing shells, 60 hours, and for youths boring top caps, 70. For women engaged in the moderately heavy work of turning fuse bodies, the maximum should be 56 hours; for women engaged in the light labor of milling screw threads, 60 hours. Probably 64 hours a week is the maximum number that it is ever advisable to work women, viewed from the standpoint of output.

The committee states that it considered the amount of output and not its cost. Where overtime is paid for at advanced rates it would be uneconomical to work hours as long as these.

The committee (same report, series No. 16) states that the studies show the unprofitableness of extensive overtime. The increase in output due to the extra hours is lost in normal hours even under favorable factory conditions. Work done before breakfast is unprofitable. The production of the before-breakfast hours is small. The data collected is prejudicial to night work, though the ill effects are at a minimum where the discontinuous system is employed. Rightly managed, the output per hour of night work about equals that of day work.

As to the influence of long hours on the health of the workers, the committee says long hours, much overtime, and especially Sunday labor, have a pernicious effect on health, particularly in heavy trades.

[The bulletins[2] of this series, issued by the U. S. Department of Labor, and embodying the painstaking studies of the British Health of Munitions Workers Committees should have the careful consideration of all health officials and health authorities of employers and employees.—Ed.]

Fatigue. McCollough[3] of Toronto thinks that in the movement for shorter hours of work the interests of employer and employee are identical. The question of temporary well-being of munition workers in Great Britain can be put aside. The men at the front are sacrificing lives and health for their country. Munition workers must do the same. The only question is: Do munition workers turn out less or more work in the shorter day? In some instances munition workers in Great Britain have worked seventy hours a week. In the Zeiss Optical Works, Prof. Abbe found that decreasing the day from nine to eight hours increased the volume of work done 3.3 per cent. The Chief Inspector of Factories and the Health of Munition Workers Committee proved that any lengthening of the day beyond eight and a half hours exhausted the worker and was of no value in increasing the output.

Occupational Disease Among Munition Workers. In a discussion of toxic jaundice in munition workers,[4] Legge said that in the earlier stages of the war he learned of seventy cases (of which twelve were fatal) of tetrachlorethane poisoning. At the time of writing tetrachlorethane had been replaced by safer explosives. Notification of poisoning by T.N.T. (Trinitrotoluene) has been made compulsory. He thinks that the human

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(2) Industrial Accidents and Hygiene Series, Nos. 14, 15 and 16.
(3) Amer. Med., May, 1917.
(4) Lancet, Feb. 3, 1917.

system has a certain tolerance for this chemical. By keeping the dose absorbed low, munition workers do not suffer. The danger is greater in the factories where T.N.T. is used than in those where it is made. The times of great speeding up of production are the times of evidences of intoxication. Most of the poison is absorbed through the skin.

The methods for the prevention of the disease are: greater cleanliness, institution of methods which do away with the need of handling the substance, and better ventilation. Viscount Chetwynd puts great stress on ventilation as a method of prevention of poisoning, claiming that fumes are principally responsible. Moore especially stressed the skin as the avenue of absorption and cleanliness as the method of prevention. He uses acetone as a hair wash. Barnes agreed with Moore and Legge, suggesting especially that greasy, dirty hands are responsible for much poisoning. He advises that dental plates be removed at night. Munday said that in navy munition plants they had not had the disease because principally of the scrupulous cleanliness maintained. O'Reilly and Smith, in addition to cleanliness, emphasized good feeding as a preventive measure.

Spillsburg, Stewart, Panton, Turnbull, Feldman and O'Donovan reported the results of autopsies and blood tests. The autopsy findings are very similar to those of acute yellow atrophy of the liver; the blood picture is very like that of pernicious anemia.

The symptoms fall into five groups: (1) dermatitis; (2) gastritis of first exposures; (3) toxic gastritis; (4) blood changes; (5) toxic jaundice. Feldman said that dark brown urine, frequent, urgent micturition, and lassitude are early symptoms.

Hudson[5] contributes a very illuminating article to the subject of explosive-industry poisons. Up to a few years ago the chemicals used in the manufacture of explosives were simple and few cases of poisoning occurred in the industry. The manufacture of black powder consists in the mechanical mixing of sulphur, charcoal and potassium or sodium nitrite. While the process is a dusty one, the dust seems to be less harmful than ordinary dust.

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[5] Med. Record, Jan. 20, 1917.

In the manufacture of smokeless powders and dynamite there is some danger from poisons. The more recent and more powerful explosives are still more dangerous. The basis of the newer explosives is some form of inflammable nitrite or nitrate.

Nitroglycerine, and certain organic nitrates resembling it, act as vasodilators producing headaches, flushed face and other well-known symptoms. It can be absorbed through the gastro-intestinal tract, the respiratory tract, or the skin. A highly susceptible person can absorb enough to cause a headache by shaking hands with a person who has been working in it or by examining his chest. Immunity is soon established.

Employees in nitroglycerine works do not suffer from chronic poisoning, according to Ebright.[6]

In a plant manufacturing high explosives acid accidents are frequent. The acid usually used is a mixture of nitric and sulphuric known in the shops as mixed acid. The nitric acid put into such mixtures is 100 per cent. acid and not the 70 per cent. acid of ordinary commerce. The harmful effects are burns, the result of splashing and fumes. To take care of splashing, baths, tubs, hydrants and other sources of quick emergency water supplies are kept at hand and the men are drilled in the instantaneous use of them. In case of a splash burn, water is turned on the splash immediately and then a saturated solution of bicarbonate of soda is applied so long as any foaming occurs. Next a burn salve or ointment is applied. Acid splash burns are very apt to produce keloid. These are treated by *x*-rays or radium. In the DuPont-deNemours factories they place burn cabinets at convenient points. These are 18½x16½x7¼ and contain: 1 bottle saturated solution bicarbonate of soda, burnt ointment, soft rubber syringe, eye cup, aromatic spirits of ammonia, glass, chloroform ampoules 15 minims each, absorbent cotton, 4 and 2 inch gauze bandages, 5 per cent. cocaine solution, ½-inch adhesive plaster and 3 per cent. solution of iodine.

The greater number of acid accidents are due to the

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(6) Jour. Amer. Med. Ass'n., Jan. 17, 1914.

inhalation of fumes. The nitrous fumes contain the brownish red nitric peroxide, other corrosive gases and finely atomized liquid acids. The effects are due chiefly to pulmonary edema caused by local irritation. When there is pneumonia it is of the lobar type. In poisoning by ammonia gas or chlorine gas the fumes are so irritating as to produce spasm of the glottis, which limits the poisoning to the upper parts of the tract. In poisoning by nitrous fumes this shutting down of the glottis does not occur and the edema is very apt to be more widespread. When a man gets nitrous fumes he should take breaths as shallow as possible.

A factory should be equipped with ammonium carbobonate sprays for neutralizing the fumes, and oxygen-and-air helmets. Respirators containing sponges saturated with alkali solution are helpful. A 20 per cent. solution of caustic soda, or a saturated solution of bicarbonate of soda, is as strong in alkali as we dare use. There is room for a respirator in which the air passes through a saturated solution of caustic soda, but in which there is no danger from alkali burns.

A person who has been fumed should take 15 drops of chloroform to a tablespoonful of aromatic spirits of ammonia in a glass of water. This should be taken in one hour, drinking it in several portions. An atomized soothing oil is helpful. A person who has been fumed should stay out of the factory a week.

The newer explosives are made from nitro-aromatics, such as nitrobenzol, dinitrobenzol, trinitrobenzol, monodi and trinitrotoluene, the various nitronaphthalenes and nitromesitylenes. They contain the No. 2 group and not the No. 3 group, and physiologically they do not act like nitrates or nitrites. They produce destruction of the blood. The symptoms of acute poisoning with these substances are frontal headache, anorexia, pains in the abdomen and around the heart, vertigo, restlessness, cynosis. A peculiarity is fever persisting at or near 102°. This, Hudson says, is the result of the liberation of hematin from the destroyed red cells. In chronic poisoning there is headache, a down-and-out feeling, jaundice, dark-colored urine and congestion of the liver. There may be cyanosis. Later symptoms are similar to those of acute yellow atrophy of the liver. While some poisoning results from absorption through the skin, absorption through the respiratory tract of the fumes from these highly volatile poisons is much more important.

The precautions necessary in a factory are opportunities for and habits of cleanliness and the best of ventilation. There must be ample and conveniently placed bathing and toilet facilities. There must be an exhaust system of ventilation with multiple exits in the floor and multiple inlets at the ceilings. Strong air currents are undesirable.

Workmen in munitions factories must not drink. The use of alcohol greatly enhances the susceptibility to poison.

In the DuPont factories blood examinations of each workingman are made at two-week intervals.

Whenever the lymphocytes run over 30 per cent., the hemoglobin drops and changes are seen in the red cells, the workman should be transferred from the factory to work in the open air. In a few weeks the man can go back to work in the factory and is apparently partially immune.

Following these plans the DuPont factories have so far escaped serious poisonings among the men.[6]

When a person succumbs to nitro-aromatic poisoning he should be removed to a place that is free from such poisoning, be stripped of his clothing, scrubbed with a mixture of soap and sand and provided with clean clothes. He should be given effervescent phosphate of soda and aromatic spirits of ammonia or dilute ammonium carbonate solution. Alcohol should not be given. Large draughts of milk are helpful. He should then be given a purge. Tolerance seems to be acquired.

Another form of poisoning found among workers in high explosives is that due to aniline, dimethyl aniline, diphenyl aniline, benzol and tritoul. Cyanosis, palpitation and quickened respiration are symptoms. Blood examinations of such cases show a falling hemoglobin percentage. There is no lymphocytosis. In aniline

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(6) For reports of poisonings elsewhere, see Chemical Trade Journal and Chemical Engineer, Oct. 28, 1916.

poisoning the addition of vinegar to the soap and sand mixture facilitates cleansing of the skin.

There is another group of poisons, some of which are more poisonous than those already treated of, but which are so nearly insoluble that in practice the harm done is practically limited to irritations and inflammations of the skin. These are picric acid (tri-nitro-phenol), di-nitro-phenol, di-nitro-chlor-benzol, tetra-nitro-methyl-aniline. Of these di-nitro-chlor-benzol is most active, its fumes causing dermatitis. The dermatitis resembles ivy poisoning. Scratching may result in absorption of the poison and constitutional symptoms.

In the manufacture of fulminate of mercury there may be poisoning from ethyl-nitrite. This causes green cyanosis.

There is almost no mercury poisoning. This is because fulminate of mercury is practically insoluble. There may be a few cases of dermatitis in a fulminate of mercury factory. A by-effect of this study is an observation that a 20 per cent. solution of nitroglycerine has exceptional value in the treatment of Raynaud's disease.

Manufacture of High Explosives. Archie Rice[7] says that workmen engaged in the manufacture of trinitrotoluol need not suffer ill effects provided they do not neglect personal hygiene. First they must not drink, since the use of alcoholic beverages increases susceptibility to the poison; second, they must keep the skin clean and, third, they must wear respirators.

In 1916 there were about 3,000 men on an average steadily engaged in the manufacture of this substance. Owing to fear of the chemicals and the hazards of accidents there were about 20,000 men who worked in the industry at some time during the year.

Russia, France, Germany and the United States use trinitrotoluol and picric acid. Fulminate of mercury is used to detonate the bursting shell. In some factories the explosive is poured into the shell in the form of a dry powder. In others it is heated until it is a syrupy liquid, whereupon it is poured.

The workmen in the first group of factories get the

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(7) Amer. Jour. Pub. Health, March, 1917.

poison as dust. Those in factories where the second method is used get it as dust and fumes. Trinitrotoluol, picric acid and fulminate of mercury are all nitro substitution compounds and produce the physiological effects of such. A nitroglycerine worker daily absorbs small quantities of the poison into his system. In spite of thorough bathing in warm water it is possible for a non-saturated person to taste nitroglycerine on this skin. A worker feels the effects at once, but then he gains a certain degree of immunity and this may persist for a considerable time, particularly if the worker wears his respirator, keeps his skin clean, washes his hands before eating and abstains from alcohol. The nitrocompounds act as heart accelerators. The more chronic effects are: Yellowing of the skin (in shop parlance such sufferers are known as canaries), headaches, bitter taste in the mouth, nausea, white frothy vomitus, increased blood-pressure, rapid hard pulse, and a skin condition somewhat similar to ivy poisoning.

The severe cases develop symptoms similar to those of acute yellow atrophy of the liver, including petechial skin hemorrhages. In a group of 500 employees Rice saw fifty cases of poisoning, two of which were fatal. The diagnosis in the fatal cases was acute yellow atrophy of the liver. There were no autopsies. For the eruption a magnesium carbonate solution was effective.

Picric acid is the most poisonous member of the group, but on account of the very unpleasant bitter taste produced by it workmen commonly keep their mouths tightly closed when making it, and in consequence picric acid poisoning is not so common.

Shop sanitation embraces hoods, exhaust fans, cleanliness and ample convenient and accessible toilet facilities.

Smelter Chills. Riesman and Boles[8] give the following rules for the prevention of smelter chills. Guard against inhalation and ingestion of metallic vapors by providing the working rooms with an efficient system of ventilation. Have a furnace room apart from the other rooms and provide proper ventilation about the furnaces. Employ an improved technique for pouring.

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(8) Amer. Jour. Med. Sci., March, 1917.

Provide for the removal of all metallic dusts and deposits about the foundry by periodic and thorough cleaning. Employ strong, healthy men to do the work in brass foundries, zinc smelters and in all trades in which zinc is poured. Do not employ minors or women. Do not demand of the workmen an amount of labor that is fatiguing. Provide proper washing and toilet facilities and advise the men as to the necessity of their proper use. Allow the men reasonable time for washing before their eating period and a suitable place for eating. Caution them to change clothing before leaving the shop. Advise them not to wear mustaches and to employ respirators. Caution against sudden changes in temperature.

Death-Rate Among Iron and Steel Workers. Edwards[9] agrees with the statement in the sixty-fifth annual report of the registrar general that the death-rate among iron and steel workers is higher than the average for occupied and retired males. The principal causes of death are heart disease, consumption, bronchitis and pneumonia. The adverse influences are: (1) Working at high temperatures; (2) long hours, fatigue, insufficient rest, sleep and recreation; (3) night work; (4) exposure to cold and wet; (5) intemperance; (6) inhalation of dust; (7) poisonous gases such as CO; (8) trauma.

He quotes a friend who advises oatmeal water, made as follows, as the best drink for workers: Pour boiling ing water on oatmeal. Let it stand until an acid fermentation has set up—three or four days. Drink the clear water. Add some boiling water daily to offset the amount drunk. Add a little oatmeal daily. The drink is acid from the presence of lactic acid.

Artificial Respiration in Industrial Accidents. In a discussion of various methods of doing artificial respiration, Bricker[1] reported upon the pulmotor, lungmotor and artificial respiration by the Meltzer method. She favors the Meltzer method. Dr. Luther said that his concern used the pulmotor, but that it is not quite efficient. Dr. George Evans said that in his concern they

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(9) Brit. Med. Jour., July 22, 1916.
(1) Penn. Med. Jour., October, 1916.

preferred the Schaefer method. They had about stopped using pulmotors. Dr. Patterson said that the very great advantage of the Schaefer method was that any layman can be taught to use it. He could not say as much for any of the devices. Dr. Lauffer said that they preferred the Schaefer method. Dr. Munson said they used the pulmotor. Dr. Hillman said that they preferred the Schaefer method.

Heat Stroke in the Industries. Stengel[2] says that if the temperature, as shown by the wet bulb thermometer, exceeds 78° F., continuous hard work is impracticable. It is impracticable for ordinary persons to remain for long periods of time in a room where the wet bulb registers 88° F. The important reading is that of the wet bulb thermometer.

Dr. Schereschewsky in the discussion said that the body begins to feel the effect of heat when the wet bulb stands at 62.

He thinks that the effects of hot, bright lights on the eye are undue to the light and not to heat. The conjunctiva will absorb 80 degrees of the radiant heat which strikes it; but the deeper layers have but little powers of transmitting; therefore, practically none of it will reach the retina. Light, on the other hand, has great powers of penetration of the eye structures.

Dr. McCurdy thought the conditions of the excretions had more to do with heat exhaustion, heat stroke and heat cramps than did the heat itself. In his experience, whenever a worker doing hard manual labor in a hot place stopped sweating he had better get out.

Gasoline Poisoning. Albaugh[3] reports another group of cases poisoned by exhaust gases from a gasoline engine. The exhaust from this engine was discharged into a sewer pipe. This was supposed to act as a sound deadener and to conduct the gases away. The sewer pipe became stopped and all the gases came back into the basement of a small hotel. About eighteen persons were overcome, though all recovered. The symptoms were headache, dizziness, muscular weakness, palpitation

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(2) Ibid.
(3) Amer. Jour. Pub. Health, August, 1917.

and shortness of breath. The physician made a diagnosis of food poisoning and gave purgatives and warm milk.

Gasoline exhaust gas is composed in part of unburned gasoline fumes. Of more consequence, probably, is the considerable percentage of CO. This averages 9 per cent., though it may run as high as 25 per cent. The CO_2 ranges from 3 to 24 per cent. Haldane found that 0.05 per cent of C caused symptoms and 0.2 per cent. was very dangerous. Burrell found that 0.25 per cent. of CO caused him to become very ill and to remain so for eight hours.

Occupational Dermatitis and Eczema. G. L. Apfelbach[4] writing on the subject of industrial eczema gives the following list of occupations and the source of dermatitis among some of the workers in each.

Painters: (1) benzine, (2) turpentine, (3) strong alkali soaps, (4) aniline, (5) chrome.

Printers: Benzine mostly in cleansing rollers and type, and in washing in benzine after work. Calluses on fingers of compositors and machine operators, from trauma; also from turpentine and crude oils.

Chauffeurs: Benzine.

Cartridge makers: Turpentine, mercury sublimate.

Batterymakers: Acids, turpentine, chrome and other irritants.

Photo-engravers: Bichromate, acids, alkalies, pyrogallic acid, metol, silver nitrate.

Etchers: Acids, chrome, asphaltum.

Tanners: Chrome, lye, water, anthrax.

Washwomen and scrubwomen: Soap, water, chlorates, etc.

Cement workers: Mechanical irritation and weather.

Platers: Copper solutions, acids, cyanide solution.

Buffers and polishers: Mechanical irritation

Machinists: Lubricating oils, mechanical irritation.

Bakers: Sugar, water, and heat.

Bartenders: Water, beer.

Solderers: Acids.

Cigarmakers: Wet tobacco.

Cabinet makers and finishers: Turpentine, pyridin.

Florists: Flowers, especially tuberose.

Slaughter-house workers and butchers: (1) Anthrax, (2) tuberculosis of the skin.

Wool sorters and workers: Aniline, anthrax, bichromate.

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(4) Med. and Surg., September, 1917.

Physicians, nurses and health officers: Bichloride, phenol and formalin.

X-ray workers: Ultra-violet rays.

Munition workers: Trinitrotoluene, dinitrobenzol and mercury.

Information as to how to prevent industrial eczema in many of the trades is to be found in the following classification:

Benzine and Turpentine—

Trades Involved: Painters, varnishers, finishers, printers, compositors, pressmen, apprentices, cleaning rollers, printers' ink, cartridge makers, cabinet makers.

Action: Dissolves out normal oily secretions of the sebaceous glands.

Lesion: Dry dermatitis; less commonly papular moist eczemas.

Prophylaxis: Oil hands with lanolin and petroleum, or equal parts of castor oil and vaseline.

Chrome, Bichromate, Chrome Salts—

Trades Involved: Tanners, photo-engravers, battery makers, platers, paint manufacturers, dry color workers, painters, calico printers.

Action: Must be fissures, destroys epidermis and eats into cuticle. Chemical irritant.

Lesion: Ulcers, eczema, dermatitis.

Prophylaxis: Watch all abrasions on hands, wear rubber gloves, new skin or finger cots, morning inspection before going to work. Treat with calamine lotion.

Trinitrotoluene, Dinitrobenzol, Fulminate of Mercury—

Trades Involved: Munition manufacture.

Action: Irritating.

Lesion: Extensive papular dermatitis.

Prophylaxis: Gloves.

Water—

Trades Involved: Washwomen, scrubwomen, laundresses, housewives, bakers, etc.

Action: Absence of normal oil on hands; must be predisposition.

Lesion: Dermatitis, eczema.

Prophylaxis: Rubber gloves.

Petroleum, Paraffin—

Trades Involved: Machinists, oil workers, etc.

Action: Irritating.

Lesion: Boils and dermatitis.

Prophylaxis: Add coal-tar antiseptics to the oils.

Arsenic—

Trades Involved: Manufacturing insecticides, paints taxidermists.

Action: Corrosive.

Lesion: Ulcers, often on scrotum and hands.

Prophylaxis: Gloves.

Mechanical Irritation—
Trades Involved: Cement workers, stonecutters, plasterers, plaster of Paris, emery wheels, grindstones, zither players, shoemakers, buffers and polishers.
Action: Calluses, horny, thickened skin, fissures, cracks, abrasions, dermatitis, eczema, infections.
Lesion: Mechanical trauma to epidermis.
Prophylaxis: Machinery guards, petroleum on hands, gloves.

Acids: Nitric, Cyanic, Muriatic, Sulphuric, Acetic—
Trades Involved: Photographers, platers, match-makers, chemists, solderers, battery makers.
Action: Dissolves oils on skin, and acts as a chemical irritant and even burns the skin.
Lesion: Dermatitis, ulcers, burns.
Prophylaxis: Hooding tanks.

Alkalies: Sodium, Calcium, Etc.—
Trades Involved: Paint makers, soap makers, photographers, platers, washwomen.
Action: Irritating.
Lesion: Dermatitis, eczema.
Prophylaxis: Care of fissure on skin.

Tobacco—
Trades Involved: Cigarmakers (those washing leaves).
Action: Irritating.
Lesion: Dermatitis, eczema (between fingers).
Prophylaxis: Does not occur when worker dries his hands on a clean towel.

Flowers—
Trades Involved: Florists and growers.
Action: Toxic irritation of certain plants on skin.
Lesion: Dermatitis.
Prophylaxis: Gloves.

Irritating Chemicals used as Antiseptics: Bichloride of Mercury, Phenol, Lysol, and Formalin—
Trades Involved: Physicians, surgeons, nurses, attendants, health officers.
Action: Irritating.
Lesion: Dermatitis.
Prophylaxis: Substitution of other antiseptics such as alcohol.

Occupational Mortality. Wynne and Guilfoy[5] made a study of mortality in relation to occupation in New York City. The difficulty in drawing correct conclusions as to occupational mortality is based upon several points. In the first place diagnosis is not always dependable, since the occupation just prior to death may not have been the occupation responsible for the illness. In the third place some of the groups are small. And, finally, the significance of occupation is not generally appreciated by attending physicians.

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[5] Pub. Health Rep., June 8, 1917.

The mortality from consumption among printers and compositors is more than twice the average consumption rate. Other occupations with a very high consumption rate are clerks, bookkeepers and office assistants, and teamsters and drivers. The explanation of the rate among printers is poor ventilation; among bookkeepers, poor ventilation plus low wages; among teamsters, indulgence in alcohol. Other occupations with high rates are cigarmakers and tobacco workers, laborers, machinists, painters, paper-hangers and varnishers.

The cancer rate is low in those occupations requiring hard labor and high in office workers. The occupations in which Bright's disease exacts a heavy toll are blacksmiths, cigar workers, garment workers and machinists. Lobar pneumonia rates were heavy among blacksmiths, clerks, bookkeepers and office assistants, compositors and printers, laborers, railway, track and yard workers and saloon keepers and bartenders. Saloon keepers and bartenders have the highest cirrhosis-of-the-liver rates.

Consumption in Certain Trades. Crum[6] says that of the 44,000,000 wage earners in the United States 5,500,000, or 12.5 per cent., work under conditions af atmospheric pollution conducive to consumption. As a result of statistical study he found that the consumption mortality in the dusty occupations was 41.1 per cent. in excess of that in the non-dusty trades. The excess for all diseases of the respiratory tract was 23.1 per cent. Comparing the statistics for stone and marble cutters with those for farmers, it is found that the consumption rate of the former is 125.1 per cent. greater than that of the latter. Workers in metallic dust at ages 25 to 34 had a consumption mortality of 369 per cent. in excess of that in the non-dusty trades. Other excesses were: Mineral workers, 25 to 34, 10 per cent.; 35 to 44, 22.3 per cent. Workers exposed to vegetable dusts, 25 to 34, 38.4 per cent.; 35 to 44, 31.3 per cent.

Dr. Crum gives the figures for seventy-seven dusty trades in comparison with non-dusty trades. The percentage of deaths from consumption to deaths from all

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(6) Penn. Med. Jour., October, 1916.

causes among the non-dusty trades is 40.1. Other averages are workers subject to metallic dust, 53.9; mineral dust, 44.1; animal and mixed fiber dusts, 53.9; vegetable fiber dust, 55.5; street dust, 43.1; general organic dust, 51.8.

Examination of Department Store Employees. Kahn[7] advises every department store with 250 employees or over to have a physician or nurse in attendance on the employees. It is advisable to examine applicants for employment and periodically to examine all employees. Of the persons applying for employment at one store, 10 per cent. had tuberculosis. A part of the service of such a department would be lectures to the employees on health conservation.

MILITARY HYGIENE.

Some War Lessons. Kenwood[1] prophesies that some of the capacity for organization for destruction shown by the English in this war will be shown as capacity for organization for production of better health subsequent to the war. The discipline and enforced personal hygiene of the camps will influence the after-life of the present soldiers. This war has taught England many lessons. One is that a low birth-rate is not compatible with national existence, to say nothing of national military, commercial and social supremacy.

Another lesson is that methods of controlling measles must be found and universally adopted.

Better housing must be provided and better housing standards must be adopted in England. There must be better care for pregnant women.

The war has proved the efficacy of typhoid vaccination. In the Spanish-American War in six months there were 20,738 cases of typhoid among the 107,973 American troops. In South Africa there were 57,684 cases of typhoid and 8,000 deaths from it among the British troops. The typhoid rate among troops in this war is less than that of adult males of the civil population in

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(7) Med. Record, Nov. 25, 1911.
(1) Lancet, Dec. 30, 1916.

England and Wales. The reports from France and Germany are equally good.

The convictions for drunkenness in England have fallen between 40 and 50 per cent. The prohibition of the use of vodka in Russia has increased the industrial efficiency of Russia 20 per cent. Kenwood says: "After war broke out all parties combined against the common enemy—Germany. Is it too much to hope that when peace comes all parties will combine against this even greater adversary?"

He thinks that out of the war will grow a program for the control of venereal diseases.

In spite of the education of the people in recent years in the use of fresh air, the calling out of men from all strata of society demonstrated that a large proportion of the people were still in the habit of sleeping in rooms where the windows were habitually battened down. This almost universal disregard of good ventilation and the failure to find a foot cover which would keep the feet warm and dry is responsible for much of the catarrhal affections, a good deal of the pneumonia and most of the cerebrospinal meningitis.

Sanitation in War. Saville[2] stepped into the breach upon the entrance of the United States in the war and critically drew from the second edition of Lelean's "Sanitation in War" and Toumade's *"La Pratique de l'Hygiene en Campagne"* many practical methods (Figs. 15-18). A method of improving a field shower is shown in Figure 16, and a method of constructing a latrine in the trenches is shown in Figure 18.

He says that the soldier should wear a woolen undershirt and drawers, heavy in cold weather and light in warm, but always woolen. The undershirt should be long enough to double like a binder over the abdomen. Every regiment should have one skilled chiropodist. Boots must be large enough to permit two pairs of socks to be worn. The pair next the skin should be woolen. Men in the trenches grease their boots once a day. All blisters on the feet are pricked and painted with tincture of iodine. Corns are painted daily with a solution consisting of 60 grains of salicylic acid, 8 grains of can-

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(2) Amer. Jour. Pub. Health, June, 1917.

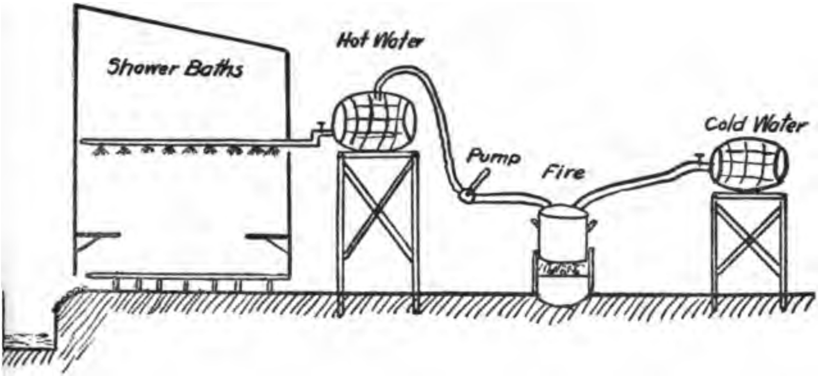

Fig. 15. A unique arrangement for shower-baths devised for the vicinity of the trenches.

nabis indica and 1 ounce of flexible collodion. In a few days they can be removed.

The English use kitchens-on-wheels very largely. These consist of insulated ovens and compartments arranged around a central furnace, the whole mounted on two wheels. This traveling kitchen will cook for 250 men and officers.

Love[3] gives a summary of sanitation methods used by his command at Brownsville in 1916. Filters of the

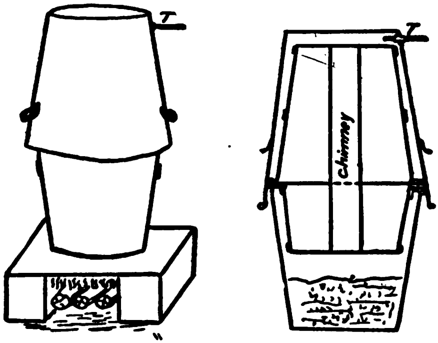

Fig. 16. For disinfection by formaldehyde in the army. Inverted conical parts. A closed chimney passes through the center and a thermometer opening is left at the top. The articles to be sterilized are placed around the chimney and a temperature of 100° C. is attained.

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(3) New Orleans Med. and Surg. Jour., June, 1917.

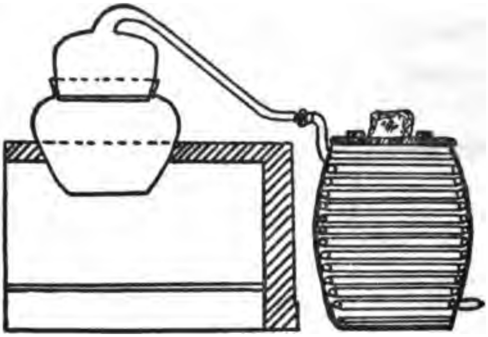

Fig. 17. Retort filled with water: the steam generated passes through spiral lead pipes coiled about the inside of a wooden cask.

Daniell type were used at times. At times the water was chlorinated in Lyster bags. Garbage was incinerated either in the rock pile company-kitchen incinerator or else in larger incinerators. At times excreta was burned; at other times, the deep pit latrine was used. On the march the straddle latrine was employed. Picket line refuse was burned in windrows.

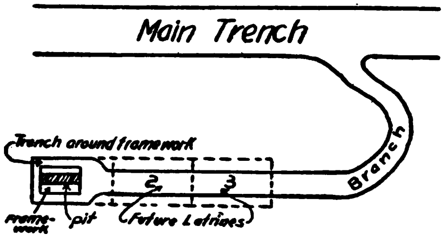

Fig. 18. Arrangement for safe disposal of excreta in the trenches.

Health of Troops on the Border. Chamberlain[4] says that typhoid fever need no longer be dreaded as a scourge to armies. Among the 170,000 troops who served on the Mexican border between May 1 and October 18, 1916, there were but twenty-four cases of typhoid. There were no deaths. Contrast this with the 20,926 cases and 2,192 deaths in eight months among the regular and volunteer troops in 1898.

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(4) Jour. Amer. Med. Ass'n., Nov. 25, 1916.

Of these twenty-four cases six were regulars and eighteen volunteers. Of these, two regulars had never been vaccinated, two volunteers had been incompletely vaccinated, one regular was vaccinated in 1911, two in 1912, one regular and one volunteer in 1913, two volunteers were vaccinated in 1914, three in 1915, nine in 1916 and the vaccinal history of one was not determined. There is proof that some of the volunteers who had typhoid were vaccinated with vaccine of poorer grade than that used in the army.

[If the reaction after typhoid vaccination is excessive the French give a small dose of aspirin one to two hours after the injection. The English give 30 grains of chloride of calcium just before and six hours after the injection.—Ed.]

The water was purified where necessary by hypochlorite. The Lyster bag method was generally employed. Kitchen garbage was burned in incinerators. Latrines were covered by fly-proof Havard boxes, urinal troughs were swabbed daily with crude oil. The pits were burned out daily with crude oil and straw. Spraying with coal oil and lamp black was sometimes employed. Manure was removed early and often. Flies were caught with fly paper and fly traps and poisoned with formaldehyde.

But the greatest factor by far in the eradication of typhoid was vaccination. There were 250 cases and one death from paratyphoid due to *Bacillus A*. This was diagnosed by blood culture. The epidemic was stopped by vaccination with paratyphoid *A* and *B*.

There were eight deaths and a considerable number of cases of dysentery. Some of these were due to amebas and others to bacilli.

There were thirty-eight deaths from disease among the volunteers and nineteen among the regulars. Of these only twelve among the militia and five among the regulars were due to acute infectious diseases.

As compared with 1898 these figures seem almost unbelievable. The sickness disability rate was always less than 2. Venereal disease was responsible for 16 per cent. of the total sickness disability rate.

Work against malaria was somewhat slow in beginning and somewhat hampered by lack of certain supplies, but the disease caused no deaths and but little sickness, excusing the soldiers from duty. When the militia were taken over by the national government it was found that they were ill prepared medically and from a sanitary standpoint. In some instances, 30 per cent. of the men were found to be physically unfit. Of the 878 militia discharged, 114 had hernia, ninety-four had disease or deformity of the feet, eighty-one had eye defects and seventy-seven disease of the bones and joints. Other conditions were less in number. A militia surgeon had passed one man who had a cork leg.

Among Chamberlain's conclusions are these:

1. State troops can be maintained in a state of health in Southern camps for an indefinite time.
2. All members of the national guard should be vaccinated against smallpox, typhoid and paratyphoid.
3. The physical standards of the regular army should be applied to the militia.
4. The medical corps of the army is inadequate for times of war.
5. The Medical Reserve Corps should be increased.
6. The sanitary corps should be increased.

Disposal of Camp Wastes. Phalen[5] gives the methods of camp refuse disposal in use in the United States army. All kitchen waste is burned. The well-known type of kitchen incinerator (a pit 4 feet deep and 6 feet long by 3 feet wide and filled with cobblestones) will suffice for all kitchen waste and burnable camp waste.

The manure of a camp in which there were 4,000 horses (about 100 wagon loads a day) was burned with satisfaction on a dump 1,000 yards long and 80 yards wide. To burn, it was necessary to use about five barrels of oil a day; five men were required to fork the manure and feed the flames. Picket lines should be cleaned constantly. The manure should be hauled away once a day. It is not feasible to haul manure to an uncared-for dump. Swarms of flies will always result from such an arrangement, regardless of the distance to which the manure is removed.

Dead animals are burned in pits. A half cord of

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(5) Amer. Jour. Pub. Health, May, 1917.

wood and a couple of buckets of crude oil will burn a horse.

Where human feces can not be disposed of as water-borne sewage the deep pit latrine is the best method of disposal. A company latrine should be 8 feet deep, 18 inches wide and from 18 to 20 feet long. A company box should be 18 feet long and have eight holes. The box should be fly-proof. The latrines must be burned out daily; one gallon of oil and 14 pounds of hay a day are used for each latrine. Spraying the interior of the latrine pit daily with a mixture of coal oil and lamp black may be found to be superior to the burning-out method.

Copeman[6] says that the disposal of horse manure in military camps becomes a formidable problem if facilities are not at hand for its immediate removal, because it becomes an incubator for the larvae of flies. Incineration is impracticable because of the amount of valuable fertilizer thus destroyed. Treatment with borax prevents breeding of flies, but the quantities required decrease the fertilizing value of the manure and add to the expense of preservation. Experimentally, it was determined that by close packing of large quantities of manure on a firm prepared base, such as cement or earth stamped with heavy oil, resulted in fermentation of the manure and produced such a temperature within the pile that the larvae were killed.

Prof. F. M. Howlet, entomologist to the Indian government, killed maggots by temperature of from 114° to 118° F., and he thinks they could not live long at temperature of 106° F. Dr. Gordon Hewitt, dominion entomologist for Canada, found that a temperature of 104° F. was too great for the larvae and anything above that roasted them alive. Temperature determination upon a large pile of fermenting manure showed temperatures 1 inch below the surface to be as high as 106° F. and as high as 164° F. at a depth of 10 inches. Such temperature conditions precludes the development of fly larvae. The high temperature produced in the interior of the pile does not materially decrease the fer-

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(6) Lancet, June 15, 1916.

tilizing value of the manure as demonstrated by subsequent experiments.

Sanitation in the British Army. T. H. Goodwin[7] gives in detail the methods of sanitation employed by the British Army on the Western Front. One non-commissioned officer and four men are detailed to supply water to the men in the trenches. Each battalion has a sanitary detachment known as sanitary police consisting of one non-commissioned officer and eight men. These men look after the sanitation of latrines, ablution places, cooking places, slaughtering places, horse lines, etc. A sanitary squad consists of one sergeant and five privates. One such squad is allotted to each road or railway post.

A sanitary section is equipped with laboratory men and laboratories both fixed and mobile.

After trying several methods, the removal system for excretions was adopted. Boxes are placed in dugouts. These are taken away, emptied and the contents burned.

Manure is burned when feasible. In summer a manure dump on hard ground when well packed will heat to 130° F., which is nearly 50 degrees more than is required to kill fly eggs and larva.

A division should be provided with bathing facilities enough to bathe 1,000 men a day. Facilities for 2,000 are better yet.

Personal Hygiene in War. Gabriel Peyronnet de La Fonveille[8] advocates garments made of kapock. This fabric is said to be much warmer than cotton or wool. It is also much lighter. Garments made from it hold so much air that they act as a life preserver, up to a certain point, for a person thrown in the water. When garments have been wet they dry quickly. The garments keep well. They do not decay or wear out quickly.

To make clothing waterproof the following plan is used: Take from 5 to 10 parts of lanolin, liquefy by adding a little chloroform. Dilute with from 90 to 95 parts of automobile gasoline. The uniform is plunged in this mixture, left for a few minutes, removed, wrung out and dried in the air.

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(7) Military Surg., October, 1917.
(8) Ann. d'hyg. Pub., January, 1917.

Other garments are coated with a mixture of 1 part talcum and 2 parts vaseline.

The writer holds that in war the hygiene of the civil population should be conducted on a war basis, since the soldiers are endangered by disease in the civil population. The hygienists of the army and those of the civil population should work hand in hand. The French law of Aug. 14, 1914, recognizing this need, divided the land into sanitary districts. The regulation of sanitation in these districts is made effective. The law prescribes that during the war vaccination of all persons not successfully vaccinated against smallpox within five years is made compulsory. As a typhoid vaccination he suggests that each recruit be given a copy of a small pamphlet used by the English. The introduction to this pamphlet written by Kitchener says: "I call the attention of each soldier to the following instructions to which in the interests of the health of the army I attach the greatest importance." The pamphlet says: "In all wars typhoid fever is a serious factor. In the South African war there were more deaths from typhoid fever than from wounds. In actual war it is proper to fend against typhoid fever by careful supervision of the water and of food and by other sanitary measures, but in spite of all a number of soldiers are attacked by the disease.

"Inoculation gives the organism the power to resist the disease. The great value of inoculation is clearly demonstrated by the following facts: Of 421 cases of typhoid among English troops in the present war 305 had not been inoculated within two years. Of these 421 cases, thirty-five died. Of these deaths, thirty-four had not been inoculated within two years. The one who died in spite of inoculation had taken but one dose instead of the full three doses required for protection."

Cause of Rejection of Recruits. Costello[9] says that 50 per cent. of the applicants for entrance into the navy fail to pass the recruiting officer. Of the rejections, 35 per cent. are due to defective vision. Vision of 15/15 without glasses is the minimum vision required

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(9) Amer. Jour. Pub. Health, May, 1917.

in the navy. The second most frequent cause of rejection is flat foot. Distinction must be made between flat foot due to broken arch and the flat foot which is physiologic with some races, and especially those who have gone bare-footed a good deal. The latter should not disqualify. Bad teeth cause 27 per cent. of the rejections. A man to be accepted must have twenty sound teeth, of which there must be four opposing molars and four opposing incisors. Defective hearing is a frequent source of disability. So is color blindness. While many are rejected for hernia and hydrocele, 75 per cent. of these are operated on and afterward accepted.

Physical Unfitness. Orr[10] says that two or three out of each four applicants for the regular Army are rejected as physically unfit. The young man who has dissipated his energies and undermined his health has sinned against his citizenship to an extent for which his atrophic manhood can never atone. While the upper age is 35, it is seldom in the interest of the service to enlist men over 30, and experience has shown that soldiers under 20 do not stand the hardships and fatigue of a campaign well.

Venereal Disease in the Austrian Army. Hecht[1] says that venereal disease is to be classed as an infectious disease. Men with infective venereal disease under no circumstances are to be allowed home leave. He estimates that the number of men in the Austrian army who, at the time of writing, are being treated in hospitals for syphilis is several hundreds of thousands. He advises that men with venereal disease be placed in venereal disease commands and sent to the front. Such commands should have provision for the proper medicinal treatment of the men on duty. Nusser long ago pointed out that it was feasible to treat properly both syphilis and gonorrhea while the men were on active duty in line. Hecht says that since the war began a total of sixty divisions of the Austrian army have been temporarily withdrawn from the trenches to be treated for venereal disease.

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(10) Amer. Jour. Pub. Health, May, 1916.
(1) Wien. klin. Wochenschr., Dec. 21, 1916.

Malaria in the French Army in Macedonia. Grall[2] reports that the French army in Macedonia suffered heavily from malaria in 1916. In March, April and May the number of cases per month averaged about 200. In June it was 1,300; July, 4,500; August, 5,000; September, 8,500, and October, 7,000.

Grall thought that protection based upon measures directed against mosquitoes was not very effective. Prophylactic use of quinine is effective in April, May and June when the infection is not severe. The dose must be small, else it does more harm than good; it should vary from 4 to 5 grains. Beginning in midsummer, the dose may be 8 or 9 grains four or five times a week, and 4 grains twice or three times a week. It should be taken at night. Coffee should be taken with the quinine. To cure completely those who are badly infected he advises giving from 12 to 15 grains in the evening for five days. During the following five days he gives a dose of quinine a day, but reduces the dose to 5 to 10 grains a day. Then the individual takes from 12 to 15 grains a day for 5 days. Then another 5 days of 5 to 10 grains a day. This routine is kept for four or five weeks. When quinine does not cure malaria Grall suggests that there is probably a concomitant infection with amebas. In that case quinine will not kill the malarial parasites until after the amebas have been killed by ipecac or emetine.

Lice and Typhus. Bacot,[3] as the result of a great deal of experimenting, has arrived at the conclusion that it is possible to prevent the spread of lice among soldiers by washing the shirts and underwear in the following way:

An emulsion is made by mixing from 45 to 50 per cent. of soft soap, with heat, with from 50 to 55 per cent. of crude phenol. A 5 per cent. solution of this in warm water is made. A 3 per cent. solution is too weak, and more than 5 per cent. in the solution will cause irritation of the skin. The garments are dipped in this and then wrung out. An ordinary flannel shirt will retain

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(2) Ann. d'hyg. Pub. et de méd. Leg., May, 1917.
(3) Brit. Med. Jour., Sept. 30, 1916.

from 500 to 600 c.c. of this solution, and the cost will be 1 cent a shirt, aside from the labor.

Shell Shock. M. Prince[4] suggests that shell shock is nothing more than hysteria, the result of fright. He suggests that military surgeons be taught the mental therapeutic methods to be employed, and that all soldiers be instructed that organic injury to the brain from air concussion is impossible; that no harm can come from this source, and that the way to prevent shell shock is to develop emotional self-control.

Control of Contagion in Hungary. Morowitz[5] says that the Hungarian troops have been far freer from contagion than those of Austria. He says it is rare to find a case of cholera or typhus in Budapest, which can not be said of Vienna. The reason lies in the maintenance of fourteen quarantine hospitals in the vicinity of the Carpathian mountains and of other similar hospitals along the southern and still others along the Roumanian borders. Troops, prisoners and attaches from the front go through these hospitals. Each soldier is stripped to the skin as he enters the hospital. His clothing is sterilized by steam. All hair is clipped off with electric clippers. He is then thoroughly scrubbed with soap, lysoform and water and given hospital clothes. The patient then passes into the hospital for inspection and observation by the doctor. If he is all right at the end of fourteen days he is given his clothes, is provided with a certificate and sent on his way.

Trench Jaundice. Mareschi[6] reports finding spirochetes in the organs of animals inoculated from clinical cases of trench or infectious jaundice. This disease, which is fairly prevalent in soldiers and moderately prevalent in civilians in the vicinity of camps, is probably due to spirochetes spread by ordinary wild rats. The *Journal of the American Medical Association* abstracts a number of articles appearing in Policlinico. These confirm the position of the Japanese investigators that the contagion is rat-borne.

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(4) Jour. Amer. Med. Ass'n., Sept. 1, 1917.
(5) Med. Record, Nov. 11, 1916.
(6) Policlinico, Feb. 25, 1917.

Cornet,[7] quoted by the *Journal of the American Medical Association,* says that the disease develops among persons brought in contact with rats. He is quoted as saying that in the war of secession, 1861 to 1865, 70,000 persons developed trench jaundice.

Noguchi[8] found a spirochete similar to that which Inudi thought responsible for trench jaundice in American wild rats.

Trench Albuminuria. Bussiere[9] says that when troops drawn from tropical countries are exposed to the cold of a Northern Europe winter they become especially subject to albuminuria; 20 per cent. of all sick soldiers from tropics had albuminuria. It is present as a rule in bronchitis. It is present in 100 per cent. of the cases of pneumonia. In twelve autopsies on soldiers who had died from pneumonia, large white kidneys of acute parenchymatous nephritis were found. He advises that troops from the tropics be well housed in winter. They should wear warmer underclothes. He advises that they be required to wear a flannel binder from their necks to their lower limbs, thus protecting all of the organs of the abdomen and chest.

Trench Fever. M. Mandel[1] says that the term "trench fever" is a misnomer. The disease is very prevalent in the armies on the western front. It sometimes develops in persons who have not been in the trenches. The cause is not known; that it is lice-borne is possible. The disease starts with a sudden rise in temperature. The temperature reaches normal in about ninety-six hours. After a febrile period of about two days the fever returns for another cycle similar to the first. There may be several such cycles. The other out-standing symptom is pains in the shins, which are worse at night. The shin pains may continue for months after the fever has disappeared. Methods of prevention are now under investigation.

Overeating in Germany. The *Southern Medical Journal*[2] says editorially that the Germans are themselves

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(7) Paris méd., March 3, 1917.
(8) Jour. Exp. Med., May, 1917.
(9) Ann. d'hyg. Pub., January, 1917.
(1) Jour. Amer. Med. Ass'n., Sept. 1, 1917.
(2) April, 1917.

responsible for the universal hunger which they say has made U-boat warfare necessary. Before the war the average German consumed from 4,500 to 6,500 calories a day. Of this at least one-third were protein calories. The Germans eat heavily of rich meats and drink a lot of beer. When the war came on they continued to overeat just as heavily as the government would allow.

"Had the Germans not overeaten, and had they conserved their food supply the first year or two of the war, they would not now be in such distress that they would resort to submarining merchant ships in order to make England suffer for food as Germany is now suffering."

Hookworm Infection in Southern Troops. J. F. Siler and C. L. Cole[5] examined the men in three regiments, each from a Southern state, in Fort Sam Houston in 1916 for evidence of hookworm. In the three regiments there were 3,400 men. Six per cent. of the Texas regiment were found infected with the parasite. The percentage in the Mississippi regiment was 32 and in the Alabama regiment 54.

One object of the examination was to get a line on the probable percentage of the general population of the districts from which the regiments were drawn who were infected with hookworm. The Alabama and Mississippi regiments were mostly young men from rural districts and small towns. Fifty-nine per cent. of the Mississippi regiment and 70 per cent. of the Alabama regiment were from such districts. It can be assumed then that about half of the young men in such districts in these states are suffering from hookworm.

Another object of the inquiry was to determine the effect of hookworm infection on resistance to disease and, specifically, on resistance to measles. An analysis shows that men with hookworm disease actually came down with measles with twice the frequency of men free from the disease irrespective of whether they lived in urban or rural districts. Individuals with hookworm disease who came down with measles developed complications—lobar and broncho-pneumonia and otitis media—with

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(5) Military Surg., July, 1917.

greater frequency than individuals with measles but not showing hookworm infection.

The conclusion reached was that hookworm infestation affects the general health and efficiency of the recruits and that "there is a definite correlation between hookworm disease and greater susceptibility to certain transmissible diseases."

Control of Measles Among Troops. E. L. Munson[6] says that measles is a thoroughly preventable and controllable disease. The disease need not occur in epidemic form. "Measles as a cause of military inefficiency is removable and its existence hereafter as an epidemic should be a reproach to the commander or medical officer concerned, a reflection on his efficiency and a cause for official investigation and discipline."

The measures employed in controlling the disease on the Mexican border in 1916 were as follows:

1. Consider the onset of cool weather as establishing conditions favorable to the early development and spread of measles.
2. Consider measles as one of the respiratory disease group. The general preventive measures against this group plus isolation will be effective.
3. Consider any rise in the respiratory disease sick-rate as a probable forerunner of measles cases.
4. Consider any existence of measles in the vicinity of troops as the forerunner of a miltary outbreak.
5. Find out by careful questioning of each soldier the probable number and distribution by companies of (*a*) probable susceptibles to measles, (*b*) probable immunes to measles.
6. When two or three cases of measles have occurred in the command invariably see whether any case at sick call presenting cough, "cold," headache, malaise or fever is recorded as a probable measles susceptible or not.
7. If a measles susceptible, isolate it at once as a measles suspect until proven negative, which can usually be done within three days by absence of eruption.
8. In the presence of a measles outbreak invariably isolate all catarrhal cases having a temperature of 101 degrees or over.
9. In the presence of a measles outbreak encourage all catarrhal respiratory cases to see the surgeon at once.
10. In the presence of a measles outbreak have all tents visited by a medical officer daily and men lying down subjected to examination for probable measles.

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(6) Military Surg., June, July, August, September, 1917.

11. Where a considerable measles infection is suspected pass down the line of men at roll call and examine the faces for appearance of illness. If present take the pulse. If this be rapid have the man step out and take temperature. If this is above normal examine as to respiratory and other symptoms.

[This should include examination of the mouth for Koplik's spots.—Ed.]

12. Endeavor to make a diagnosis as early as possible during the preeruptive stage. To wait until the rash appears is to wait until the infection has had a chance to spread.

13. Keep careful records of the daily number and distribution of cases as they occur.

14. Look for recurrent waves of cases about twelve days after the appearance of the rash in the possible infecting case.

15. If possible isolate all contacts for fourteen days. At any rate isolate all contacts reporting themselves as probable non-immunes.

16. Disinfect all belongings of cases and contacts by exposure to sun and wind for at least two hours. If weather is stormy disinfect by chemical solutions.

17. See that all clothing, bedding and the inside of habitations are habitually sunned and aired for at least two hours every fair day.

18. Do away with common drinking cups. Warn the men about the dangers of personal contact, lying on each others pillows or beds and using towels, pipes and other articles in common.

19. Prohibit spitting in tents. In barracks see that the spittoons are cleaned daily and constantly contain a disinfectant fluid.

20. Endeavor to have outside places of resort kept clean and well ventilated. If this is not possible see that the soldiers are kept away from them.

21. See that all habitations are properly ventilated. If on entering the air seems foul to the sense of smell remove the cause by adding ventilating arrangements, if possible, beyond the control of the soldier.

22. See that habitations are not over-heated. If too hot on entering increase facilities for escape of hot air, diminish heat production, or both.

23. If the air seems dry and irritant to the nasal passages add moisture by the evaporation of water.

24. Put every necessary requirement into writing and have it issued in the form of a general order.

25. Get this order issued as soon as the first cases appear in the command.

26. Inspect frequently to see that this order is fully enforced and obeyed.

27. Accept no excuses, explanations or promises in place of action. Time is an essential factor in preventing spread of the infection.

28. **Report all failures of full compliance within forty-eight hours to the proper authority. Make request for reprimand or yourself prefer charges in every instance where, after twenty-four hours, the conditions at fault are not rectified.**

These twenty-eight rules are quoted just as given by Dr. Munson because of the success which the border troops had in controlling measles except in two commands. These two commands failed to carry out the rules and, for that failure and the consequent epidemics of measles, those responsible were severally called to account. In this camp there was a total strength of 13,697. Of these 8,326 were reported as having had measles, 2,222 as not having had the disease. For some reason the report did not cover the remaining cases. There were 444 cases of measles in this camp. Of the susceptibles in the two neglected, poorly officered camps 52 per cent. contracted measles. Of the susceptibles among the remainder of the troops only 6 per cent. had the disease.

[The measles rate of 52 per cent. among the susceptibles of these two regiments would not be accounted high in a community of civilians. The rate of 6 per cent. would be thought to be wholly unattainable. It is significant that regimental officers are now to be reprimanded, or worse, for permitting a measles rate of 52 per cent. among their susceptibles and also that a rate of 6 per cent. is now attainable. Now that the military authorities have taken such positive position not only as to the need but also as to the possibility of controlling measles is it not fit that civil authorities should adopt a vigorous policy for the control of this disease? Especially should they consider this suggestion when several million troops are in training in camps throughout the country and measles, mumps, meningitis, and pneumonia will seriously threaten them during the winter and spring months.—Ed.]

Epidemic Pneumonia in Soldiers. H. J. Nichols[7] says that if camps are maintained during the winter months epidemic lobar pneumonia must be reckoned with.

At Fort Bliss, Tex., an epidemic of pneumonia began in November, 1916, and lasted until April, 1917. It was

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(7) Military Surg., August, 1917.

at its worst the latter part of February. In this epidemic, 56 per cent. of the cases were due to Type I. Pneumococci, 22 per cent to Type II., 2 per cent. to Type III. and 20 per cent. to Type IV. Types I. and II. furnished 75 per cent. of the cases.

The difference between the death-rates of pneumonia due to the different types of bacilli when treated with and without serum is shown as follows:

Type I. with serum, mortality 8 per cent; without serum, 39 per cent.

Type II. with serum, 21.7 per cent.; without serum, 57 per cent.

Type III. with serum, 33 per cent.. No cases were treated without serum.

Type IV. with serum, 16.6 per cent.; without serum, 0.

Nichols concludes that serum treatment saves 25 per cent. of the patients who would have died had serum not been used.

The routine method followed was to give 100 c.c. of polyvalent serum intravenously when the patient entered the hospital and to follow in twenty-four hours by an injection of serum appropriate to the type of organism found in the case. If the type had not been determined, polyvalent serum was used.

Nichols, as the result of close epidemiologic study, is of the opinion that this epidemic showed evidence of, tent, company and regimental contagion.

An interesting conclusion arrived at is that vaccination is considered a more promising measure of prevention than isolation. Vaccination is supposed to cause an immunity lasting eight months. It should be given, therefore, at the beginning of the pneumonia season. In appropriate cases meningococcus vaccine can and should be added to that from pneumonococci.

Nichols says that the Schick test shows that from 50 to 80 per cent. of soldiers are immune to diphtheria. He bases his conclusions as to the efficacy of vaccination against pneumonia largely on the reports made from South Africa by Lister.

The Soldier's Foot. A. S. Jones[8] quotes general order

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(8) Military Surg., August, 1917.

No. 26, Aug. 16, 1912, which directs the company commander personally to measure the feet and fit the shoes of the men in his command. The foot is to be measured as the man stands in his stocking feet carrying a 40-pound burden on his back and bearing all of his weight on the foot to be measured. The Munson or army shoe is to be worn [and all civilians should wear shoes built on the same general lines as those of the army shoe]. The shoe is broad at the ball and rounded at the toe. A line through the middle of the great toe and running from before back bisects the heel. The inner border of the sole is parallel with the inner border of the heel. The shoe must be ample in size but not too large.

The number of the sock worn should be four sizes larger than that of the shoe. For instance, a man wearing a No. 6 shoe should wear a No. 10 sock.

If a man has a moderate degree of weak foot he can overcome his disability by the following foot exercises taken while the feet are bare, twice a day.

1. The ball of the foot is placed on the sharp edge of a depression in the ground with the toes projecting over the edge. A thick board, table or other secure support may be used. The toes are deliberately bent downward and upward, as far as possible, thirty times. If the toes do not bend readily assist them with the hands until they become flexible.

2. The foot is moved back to a flat surface and the toes are lifted thirty times.

3. In the same position the toes are separated and closed thirty times. At first it will be necessary to assist this movement with the hands.

4. In the same position the whole front portion of the foot is lifted and lowered thirty times. The body should be kept erect and there should be no swaying or movement at the hips.

5. The inner margin of the foot is raised and the weight is thrown on the outer edge. The toes are curled downward, backward and underneath the foot as far as possible and then brought to a normal position. This is repeated thirty times.

6. Standing firmly on one foot the other leg is extended at an angle of about 30 degrees. In this posi-

tion the anterior portion of the projected foot is made to rotate describing a complete circle. This exercise brings into play the flexors, adductors, extensors and abductors of the foot.

These exercises are intended to strengthen especially the muscles of the foot and the anterior portion of the lower leg. Raising on the toes and dancing strengthen the calf muscles. In consequence, such exercises should not be indulged in until after the foot muscles and the anterior leg muscles have been developed by the above exercises.

By the persistent, patient and thorough use of the above exercises it is possible to cure moderately well-developed cases of weak foot, hallux vulgus, hammer toes, callosities, corns, bunions and crowded toes. In walking, the toe of the foot must either point inward or straight ahead. It should never point outward when the leg is being carried forward.

Ingrowing toenails should not be operated on. A wide toed shoe should be worn. The sore area should be cleaned with alcohol, the corner of the nail lifted and cotton packed under it. The corners of the nail should not be trimmed round. Bunions should be treated by spreading the toes at the front and, if necessary, pulling the bones of the ball-joints together. Rarely is operation on the bunion or on the bones of the ball of the foot justified.

In an examination of the men at El Paso in 1916 the following figures were obtained:

Number of men inspected	30,359
Number wearing correct fitting shoes	5,417
Number wearing shoes too small	21,335
Number wearing shoes too large	3,511
Corns	21,586
Toes jammed or crowded	18,106
Bunions	1,481
Toes overriding	2,145
Hallux valgus	8,751
Ingrowing nails	8,654
Hammer toes	1,204
Callosities	5,227
Good feet	18,463
Percentage recommended for foot exercises	24.67

In October, 1916, 17,000 men were sent on a march covering 104 miles. The number of men who fell out and were shipped back was 265. Of this number seventy-seven or 21.5 per cent. fell out on account of their feet. Men who fell out and later rejoined their commands while on the march were not counted.

At another time, 11,000 men were marched 60 miles in four days; ninety-nine men fell out, of whom 58.39 per cent. fell out on account of bad feet.

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